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The Mindful Reader: Learning-Augmented News Aggregation

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Design and Development of a Learning-Augmented RSS Feed Reader Program

"The Mindful Reader"

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Abstract

The Mindful Reader Project centers on the design and development of a machine learning-augmented newsfeed aggregation application. It seeks to reduce the time necessary for users to find interesting newsfeed articles, by building a user interest model from implicit and explicit article ratings and applying that model to rank incoming articles based on predicted user interest. The software was developed using code from the RSSOwl project; in tests, the user interest model grew more accurate with time.

Executive Summary

Feed aggregator software and services, such as RSSOwl and Google Reader, can be used to subscribe to websites and obtain streaming updates regarding new articles or items posted to those websites. These existing aggregators follow an email-client-like design that can make it time-consuming and inconvenient to manage high volumes of incoming articles. The Mindful Reader project aims to solve this problem by modeling user interests and using that model to rate and filter incoming articles.

As reducing user fatigue is an important goal of this project, the Mindful Reader builds its user interest model in part through observation of normal user behavior, rather than requiring explicit user judgment of every viewed article. It uses metrics established by the earlier Curious Browser projects to measure implicit user interest in article content, while still allowing the user to train the system by providing explicit content ratings.

Article ratings and contents are fed into a database of informative terms and term frequencies, which can then be used to evaluate new articles as they arrive. New articles are evaluated with a set of Naïve Bayes Classifiers, and the evaluations are used to rank the articles, so that potentially interesting articles are prominently visible in the article list.

The Mindful Reader has not been developed from scratch. To avoid unnecessary re-implementation of critical aggregator features, such as feed parsing and article rendering, it is instead based upon the RSSOwl project. RSSOwl is licensed under the Eclipse Public License; it is an open-source, cross-platform, Java-based feed aggregator that provides excellent functionality.

The Mindful Reader was tested and evaluated through a series of two week-long user tests conducted in April of 2009. The first of these tests showed that the implicit interest inference mechanism worked well for many users, and the second test showed that the user interest model improved the accuracy of its predictions with time.

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1 Introduction

This project focuses on artificial intelligence and human-computer interactions problems within the broader field of computer science. Its specific aim is to produce a software tool that can help ordinary users manage and explore high-volume web content from sources such as news web sites and blogs.

Experienced users frequently make use of *feeds* from their favorite sites to keep track of new content. Feeds, in the abstract, are streams of simplified content. They typically consist of a set of article headlines, summaries, and publishing dates for content from a particular website (or even a category within that website). These feeds are not directly read by the user. They are usually transmitted in an XML-based format, such as Really Simple Syndication (RSS) or Atom, and then parsed and displayed for the user by a type of software known as a *feed aggregator*.

Feed aggregators have been implemented in a number of ways (see section 2.4 for an exploration of some popular aggregator software). Most aggregator software focuses on an email-client like paradigm, with a 2- or 3-panel display showing feeds (analogous to inboxes or mail folders), a listing of articles, and an expanded article panel:

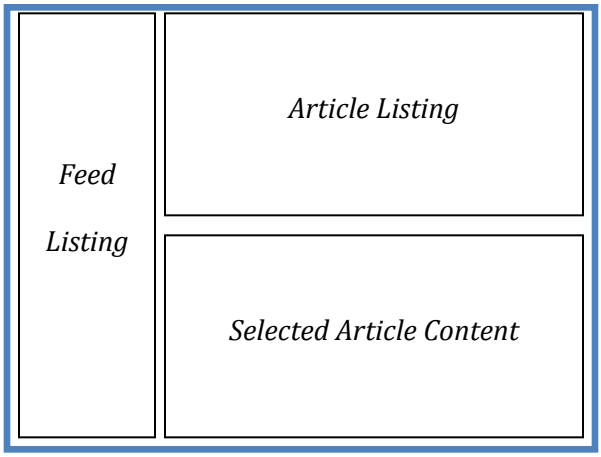


Figure 1 – Common Aggregator Interface Layout

Most aggregators provide some tools for managing and exploring feed content – keyword-based filters, searching, and sorting by various simple metrics (typically date, author/contributor, and title). However, existing aggregators do not make use of available research on adaptive news access, as pioneered by Billsus and Pazzani (2000). At present, users must wade through a deluge of new articles in prolific feeds to find the subset of articles that directly interest them. The problem is compounded whenever there is a significant gap between reading sessions, as more and more unread articles pile up over time. This search process can be highly time-consuming, and because most aggregator interfaces provide little in the way of informative article previews, it is entirely possible for users to miss items of interest.

This content management problem is non-trivial, but it is surmountable. The problem prompted the creation of the *Mindful Reader* project, with the original aim of sorting feed content in much the

same way as a Bayesian spam filter identifies unwanted or uninteresting content in email inboxes. Unlike a spam filter, the Mindful Reader does not remove or separate content, but instead sorts or ranks content within a single view. Training spam filters can be tedious, so the project gained the auxiliary goal of finding a way to automatically update the content ranking mechanism to reflect changing user interests.

The Mindful Reader project seeks to provide users with quick access to relevant and interesting articles. To do so, the Reader software models user interests, based on both inference from user behavior and voluntary explicit user input, and applies that model as a filter to incoming articles. Articles that appear to match the user's interests well, as measured by a Naïve Bayesian Classifier and comparisons to recently viewed articles, are promoted to the top of a central article listing. They are also granted an expanded content preview, so that users in a hurry can quickly skim through the most relevant news items.

To avoid unnecessary re-implementation work on standard aggregator functionality (article rendering, feed parsing, and feed subscription), the Mindful Reader is based on an existing open-source aggregator known as RSSOwl. RSSOwl was chosen as a base for numerous reasons, including the team's familiarity with its platform (Java and the Eclipse SDK), its maturity as a software project, and its helpful online developer community.

The Mindful Reader project was conducted over the B, C, and D terms of the 2008-2009 WPI academic year. The first term was spent primarily in research, planning, and design, while the second term focused on software development to implement the desired functionality. The third term saw two releases of the Reader for testing and evaluation purposes. During both tests, the software was instrumented to record experimental data; in the second test, a few testers were selected to use a control version of the software, in order to gather information on the use of a standard aggregator for sake of comparison.

News, updates, source code, and the Mindful Reader Software itself can be obtained at the project website, located at http://users.wpi.edu/~cdrouin/rssreader.

2 Background

While this project's specific focus is unique, both academic research and existing software projects provided background knowledge, inspiration, data, and even code for the project.

2.1 Feeds and the RSS Specification

While feeds assume the appearance and behavior of a 'push' medium, where content is constantly being streamed to the user, they function somewhat differently in reality. The common feed formats (Atom and various versions of RSS) actually consist of specially-formatted XML files that reside on the website which they summarize (see Appendix C – Sample XML for a properly formatted RSS 2.0 file).

2.1.1 Feed File Contents

Each RSS file contains a single <channel> element, which itself contains meta-data about the feed: title, link, and description, as well as optional items such as language and publication date (Winer). Most importantly, the <channel> element also contains a series of <item> elements; these <item>s represent articles. While all of the descriptive elements within <item>s are optional, each must contain at least a description or title element; most contain either the text content of their article or a URL leading to the full article on the related website.

Since so many feed file elements are optional, one cannot rely on an arbitrary feed containing full meta-data for organizational or classification purposes.

2.1.2 Using Feeds with Aggregators

Feed aggregators can subscribe to specific feeds by registering the URL of the feed file with the software. The aggregator will then check the file for updates on a regular basis. In many aggregators, the user can set the check frequency (for instance, once per hour or once per day) while subscribing to the feed.

As the aggregator performs these checks in the background, it appears to the user as though the feeds are constantly supplied with new content, so long as the feed is being updated by its creators. Feed files do not update themselves, but many popular website platforms (including WordPress and Blogger) can be set to automatically build updated feed files when the site content changes.

2.1.3 Aggregator Use Amongst Web Users

As of 2005, feed technology in its pure form (that is, as explicit RSS feeds subscribed to and read through a dedicated reader program) was only knowingly used by 4% of all internet users (Grossnickle et al. 2005). Meanwhile, 27% of users made use of it in some less-transparent form, such as the news and site subscription services integrated into portal sites such as My Yahoo! and iGoogle (Grossnickle et al. 2005).

While 4% of all internet users may sound like a limiting potential userbase for the Mindful Reader project, the most recent estimate of the global internet user population is 1.46 billion (Internet World Stats); by that count, RSS technology may be actively used by as many as 58 million users. The fact that the majority of RSS users do not recognize the technology by name indicates that the

project should be pitched to users on the basis of what it does in practical terms, rather than its technological underpinnings.

2.2 Academic Adaptive News Access Systems

The idea of adaptive news access is not new; it has simply never been applied to modern feed aggregation software. There are some differences between the news systems studied in past research and aggregators. The older news systems, such as *News Dude*, drew their articles from sources like Yahoo! News with a static set of content categories (Billsus & Pazzani 1999). Aggregator users can subscribe to feeds relating to any topic under the sun.

Some of these systems – particularly *ANATAGONOMY* (Sakagami & Kamba 1997) and the *Daily Learner* (Billsus & Pazzani 2000) – made limited use of implicit user interest measurement techniques to weight content during user interest modeling. The implicit inference techniques used were relatively simple – *ANATAGONOMY* noted scrolling and zooming on articles and applied fixed score bonuses to those articles (Sakagami & Kamba 1997), while the *Daily Learner* kept track of how many Palm VII screens worth of text the user viewed out of each suggested article (Billsus & Pazzani 2000).

As a rule, these systems operated under time and resource constraints. *News Dude* was designed to deliver content for a personally-tailored radio news program (Billsus & Pazzani 1999) – each article took long enough to read that it would be distinctly impractical to provide the user with all stories. Similarly, their next iteration of the concept, the *Daily Learner*, was designed to deliver content to Palm VII users with strict bandwidth limits (Billsus & Pazzani 2000). While users of the Mindful Reader will not operate under such technical restrictions, the time-consumption problem remains. The same techniques that helped limit the *Daily Learner*'s bandwidth use and shorten the *News Dude* radio programs can be applied toward the Mindful Reader's ultimate goal.

2.3 User Interest Modeling Techniques

There are two primary questions to be resolved when attempting to model user interests. The first question is how to gather interest ratings on content from the user, and the second is how to use those content-rating pairs to estimate the rating or interest potential of new content.

2.3.1 Gathering Interest Ratings

User interest can be measured explicitly, by requesting a rating from the user, or implicitly, by observing the user's behaviors and inferring their interest level from particular behaviors. As Sakagami and Kamba note (1997), both have their disadvantages: the explicit method requires constantly polling the user, which can grow irritating and drive the user away, while implicit methods are by nature imprecise and prone to disruption by unexpected behaviors.

While the implicit interest inference techniques used in *ANATAGONOMY* and the *Daily Learner* were marginally effective, the two Curious Browser projects at WPI have since advanced the field of inference techniques. The first project found that two particular user behaviors – elapsed viewing time and scrolling amount – had a strong correlation with explicit interest in a piece of web content, particularly when used together (Le & Waseda 2000). The second project, while not as successful

as the first due to procedural difficulties, noted additionally that mouse clicks and mouse movement on page had a strong correlation with user interest (Law et al. 2002).

Sakagami and Kamba (1997) also realized that a piece of software is not necessarily limited to using purely explicit or implicit measurements of interest. If the system allows users to input explicit ratings on a voluntary basis, it can fill in the gaps where users choose not to rate content (or simply forget to do so) by inferring interests from their behavior. Allowing voluntary explicit ratings serves an additional purpose: the rating interface element can be used to directly inform the user of the system's beliefs as to the interestingness of the content, and the user can correct the system if he or she feels it to have made a mistake.

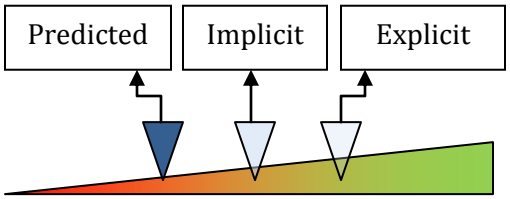


Figure 2 – Sample Content Interest Rating Scale

Each piece of content can ultimately be associated with up to three interest rating values: a predicted value derived from the user interest model applied to the content, an implicit value derived from observing the user's behaviors while viewing or interacting with the content, and an explicit value, should the user decide to provide one. Each successive value trumps the last in terms of importance to the user interest model – explicit ratings will always override implicit ratings, which in turn override the theoretical rating provided by the user interest model.

Billsus and Pazzani (2000) noticed that 'interest' alone might not be the only relevant quality of an article to a given user. For instance, users might be highly interested in the subject matter of an article, but not in the article itself, because they had already seen its specific contents elsewhere. In such conditions, feeding the interest model a negative rating would be counter-productive, potentially demoting perceived interest in the topic when the correct response would be to tighten filtering on duplicate stories. It might therefore be useful to allow users to explicitly indicate duplicated content, to avoid poisoning the user interest model.

2.3.2 Representing Interest Ratings and Content

The first step in building a user interest model from interest ratings and content is to find a way to represent that content's identifying features in conjunction with its rating. Pairing the two in this way allows the system to make a variety of comparisons in the future that will aid in classifying future content.

The most naïve way to pair ratings and content would be to sum the frequencies of all words in a given document and annotate the word-frequency values with a weight based on the interest rating; the *ANATAGONOMY* system works in this fashion, calculating a document vector for every analyzed article (Sakagami & Kamba 1997). That said, many of the words in any given document are unlikely to be useful in identifying that document. Godoy and Amandi (2005) suggest one

simple solution to the problem: a stoplist of non-informative words, typically consisting of pronouns, articles, prepositions, and simple verbs that commonly appear in all writing.

There is also the question of the most efficient and indicative type of informative term to use. The most common approach is to use single words from a document as terms. This method is suitable for most cases, but sometimes words only gain informing power when combined into phrases; for instance, an system administrator might have no interest in the words 'outlook' or 'vulnerability' separately, but have great interest in content specifically referencing an 'Outlook vulnerability.' It may therefore make sense to check for word pairs or triples in addition to single words.

Similarly, if a word or phrase has several morphological variants, its informing power will be diffused amongst those variants recorded within the interest model. Most morphological variants contain substrings of letters that are similar to their root word, however. Because of this, the variants can frequently be grouped under one heading through the use of stemming or *n*-gram analysis (Godoy & Amandi 2005). With stemming, words are matched against the longest known shared substring – 'compute,' 'computing,' and 'computer' all stem from the substring 'comput.' *n*-gram analysis looks specifically for word chunks of a given size (for the English language, typically three or four characters). Unfortunately, both of these behaviors have the potential to accidentally lump unrelated words and phrases together under the same internal representation, which can lead to inexplicable behavior.

As an alternative to attempting to automatically reducing terms with stemming or *n*-gram analysis, Godoy and Amandi (2005) suggest using lexical systems, such as *WordNet*, to reduce synonymous terms down to individual terms within the interest model. This method can be extremely powerful, but it relies on the existence of a program-accessible thesaurus appropriate to both the language and the domain of the content being analyzed. With the static-category news sources used by older adaptive news systems, this method might have been feasible, but Mindful Reader users will be free to subscribe to feeds that provide non-English content or content in specialized or uncommon domains.

2.3.3 Predicting User Interest in New Content

Given a representation of the content and associated ratings of previously viewed articles, one can extrapolate a predicted interest rating for incoming content. Once again, the *ANATAGONOMY* system has a simple but useful method for achieving this: it compiles all content-ratings pairs into a 'prototype' document vector where each word has a rating weight. It then compares the incoming document vector directly and calculates an estimated rating based on matching terms (Sakagami & Kamba 1997).

A more advanced technique is to identify informative terms using the term frequency-inverse document frequency (tf-idf) metric. Terms that appear frequently in a given document, but infrequently throughout the observed collection of documents, tend to be good indicators of content (Billsus & Pazzani 2000). This value can be calculated at the time of the document's initial observation, but it might be unwise to do so, as the overall collection of documents can change greatly over time, particularly during the start of user observations.

Billsus and Pazzani (2000) noted that a successful user interest model would need to capture both long- and short-term user interests. Toward this end, they created a hybrid model that analyzed articles in two different ways. The first was a textual comparison of the new article with recent interesting articles looking for similarity within a certain range. Articles within this range were considered likely to be relevant to the user's short-term interests. Articles that were too similar were classified as duplicates and discarded, and apparently unrelated articles were passed on to the second half of the model for long-term interest comparison via a naïve Bayesian classifier.

$$p(class_j) = \prod_i^n p(f_i|class_j)^{N_i}$$

Figure 3 – Naïve Bayesian Classifier (Billsus & Pazzani 2000)

Under Billsus' and Pazzani's (2000) naïve Bayesian classifier, the probability that an article falls into a class (interesting or non-interesting) is equivalent to the product of the individual probabilities for each informative term *f* existing in an article of that class, each raised in turn to the power of their overall frequency within the observed collection of documents *N*. The term *i* represents which feature *f* is presently being evaluated, out of *n* total features. The probability that an article falls into the 'interesting' class can be used as a predicted interest rating.

Spam filtering and article classification are similar in several ways: in addition to using similar mathematical methods, both techniques are trying to hit a moving target. For spam filtering, this target is the rapidly evolving techniques that spammers use to attempt to bypass filtering; for article classification, the target is the user's interests, which can change dramatically over time. While Billsus and Pazzani's hybrid model was very successful, it was arguably somewhat of a stopgap measure in that it did not directly model the decline of user interests with time.

Godoy and Amandi (2005) suggest that one could model the decline of interests directly by tracking informative term frequencies over discrete time periods, instead of simply keeping a running sum. That time period information can be used to project future frequencies with a linear regression. It might be possible or desirable to perform more complex regressions on the data, particularly if users' interests were observed to follow a particular trend (say, a quadratic rise and fall with time), but such complex computation could negatively impact the overall performance of the software.

2.4 Existing Software

There are multiple mature feed aggregator systems, both as stand-alone applications and as plug-ins or features implemented within larger applications. Even some single-purpose applets like weather monitors make use of the underlying technology.

For the purposes of this project, the many open-source reader applications were the most interesting and relevant, because their underlying technology could be examined directly and incorporated or modified into the augmented reader software. To determine the potential attractiveness of each project as a base, the projects were assigned scores from 1 to 5 for a number of pertinent features; the highest-scoring project, RSSOwl, was chosen as the basis for the software.

2.4.1 RSSOwl

RSSOwl (Pasero 2008) is a Java-based, open source, multi-platform feed reader program. It has many useful features, including:

- support for multiple feed specifications (RSS, Atom, RDF) (Pasero 2008)
- custom feed organization via nesting folders
- per-feed preferences (allows one to determine how frequently feeds are polled, what sort of items are displayed)
- direct import of feeds from website URLs
- support for plug-in extensions

Visually, the reader program resembles an email client, with feeds (analogous to inboxes) on the left, article listings in the upper right, and article content in the lower right. The article listing provides very limited preview of the content (title, publish date, author, and category where available).

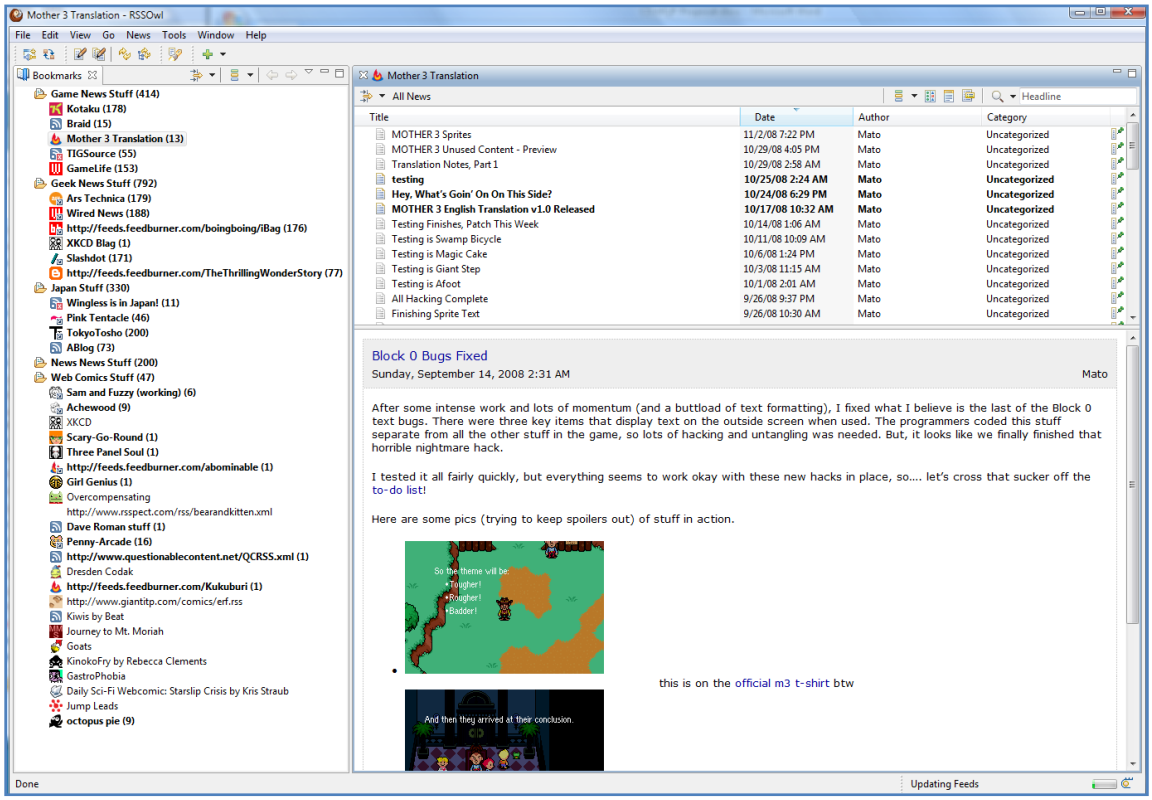


Figure 4 – Typical RSSOwl Configuration

RSSOwl has a small developer community with a wiki-based documentation site, accessible at http://wiki.rssowl.org/ . RSSOwl is based on the Eclipse software development kit (Pasero 2008), which is strongly supported and integrates well with the Eclipse integrated development environment (IDE).

As seen in Table 1, RSSOwl is an attractive development platform, since it already provides full aggregator functionality and is written in Java. It also has strong developer support amongst a small community of developers, including the highly active Benjamin Pasero (see Appendix B for communications with him related to this project).

Table 1 – RSSOwl Project-Relevant Features

	Description	Score
Modifiability	Modify existing code	3
Language (Familiarity)	Java	5
Feed Parsing	Full	5
Article Rendering	Plug-in renderer	5
Multiplatform	Win/Mac/Linux	5
Dev Support	Forum/Wiki	4

2.4.2 Mozilla Thunderbird

Thunderbird (Mozilla Corporation, 2008) is primarily an open-source email client, but it also supports feed subscriptions. It treats feed articles almost identically to emails. This means that users can apply the same rules-based filtering system for emails to feed articles; through this system, users can automatically re-route articles based on their contents or other associated data (date, author, etc.). While useful, this system requires a high level of manual maintenance to continue functioning.

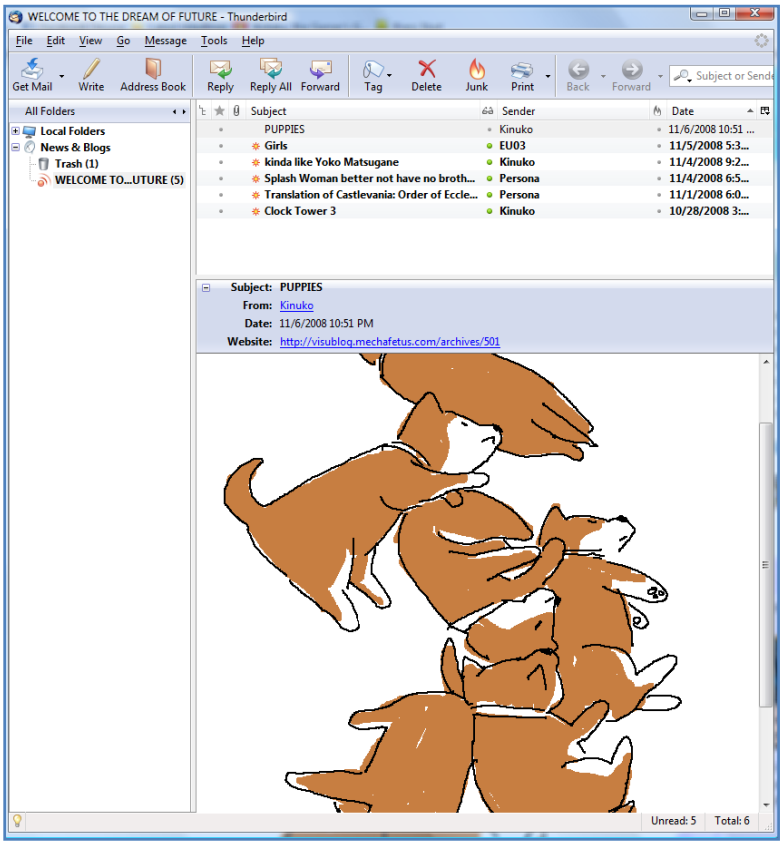


Figure 5 – Mozilla Thunderbird Configured as an RSS Reader

As can be seen in Figure 5 – Mozilla Thunderbird Configured as an RSS Reader, much of the interface is dedicated to email-specific functionality, and Mozilla's own website does not mention prominently that Thunderbird contains this capability (Mozilla Corporation 2008). That said, the software does have the advantage of Mozilla's excellent Gecko HTML rendering engine, as well as other components (such as its extension system) that it shares with the popular FireFox browser.

Thunderbird is extensible, like FireFox, but extensions must be developed in a combination of Mozilla's XML User Interface Language (XUL) and JavaScript. As one of the most popular open source projects in existence, it has an extensive developer community, and it is both well-documented and well-supported.

	Description	Score
Modifiability	Extensions only	2
Language (Familiarity)	XUL/Javascript	1
Feed Parsing	Full	5
Article Rendering	Gecko built-in	5
Multiplatform	Mac/Win/Linux	5
Dev Support	Active developer community	5

Table 2 - Thunderbird Project-Relevant Features

2.4.3 RSSBandit

RSSBandit (RSS Bandit 2008) is a Windows-only RSS reader based on Microsoft's .NET platform, programmed in C#. It is, however, an open-source project, and it is the only reader that integrates directly with the popular Google Reader and NewsGator Online aggregator services. It can also manage podcasts, and its interface supports a tabbed display model for easier navigation (visible in Figure 6 – RSSBandit Interface); the interface is extremely similar to Microsoft's own Outlook mail client, which may be appealing and familiar for many users.

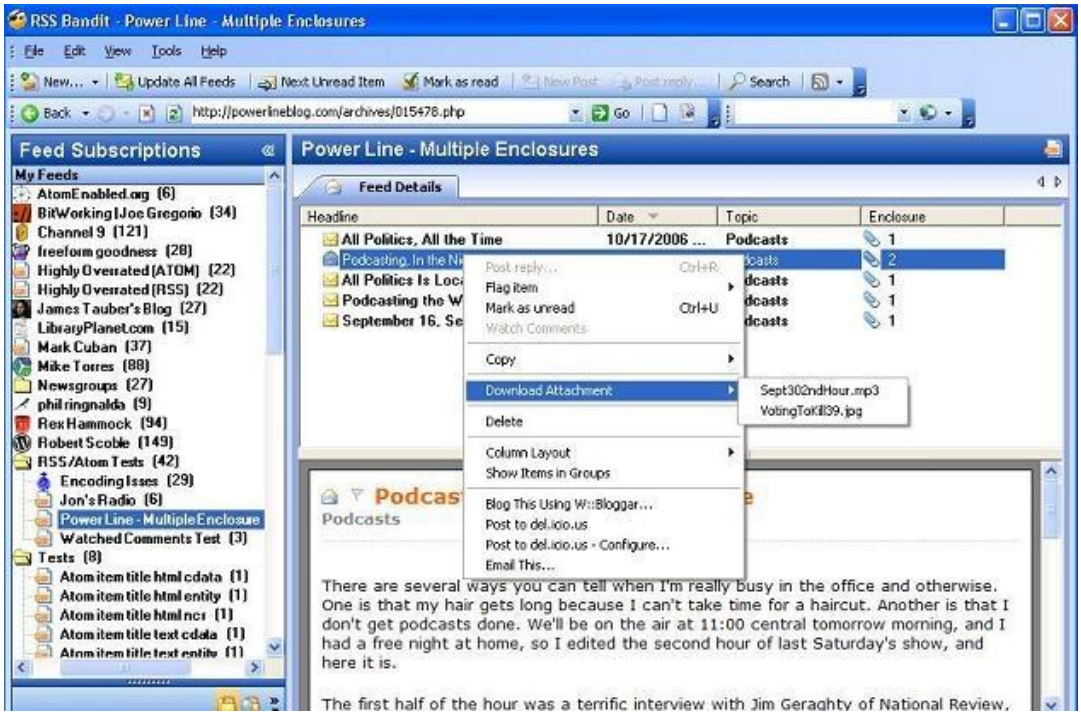


Figure 6 – RSSBandit Interface

RSSBandit's community appears to focus largely around its SourceForge page and its developer mailing list; developer documentation and support are not emphasized. It also has the major disadvantage of being a Windows-only project; it would be difficult or impossible to port the code to another platform.

Table 3 – RSSBandit Project-Relevant Features

	Description	Score
Modifiability	Modify existing code	3
Language (Familiarity)	C#/.NET	3
Feed Parsing	Full	5
Article Rendering	Internet Explorer embedded	3
Multiplatform	Windows only	1
Dev Support	SourceForge site	3

2.4.4 BottomFeeder

BottomFeeder (BottomFeeder 2008) is one of the oldest RSS aggregators in existence; unusually, it was developed in SmallTalk, and it supports an extremely wide range of computer platforms (from Windows to obscure platforms like SGI Irix). It has a custom HTML rendering engine (with advanced style sheet support) and full support for almost all feed formats. It also has a simple filter definition system, which lets users supply keywords that they want to avoid.

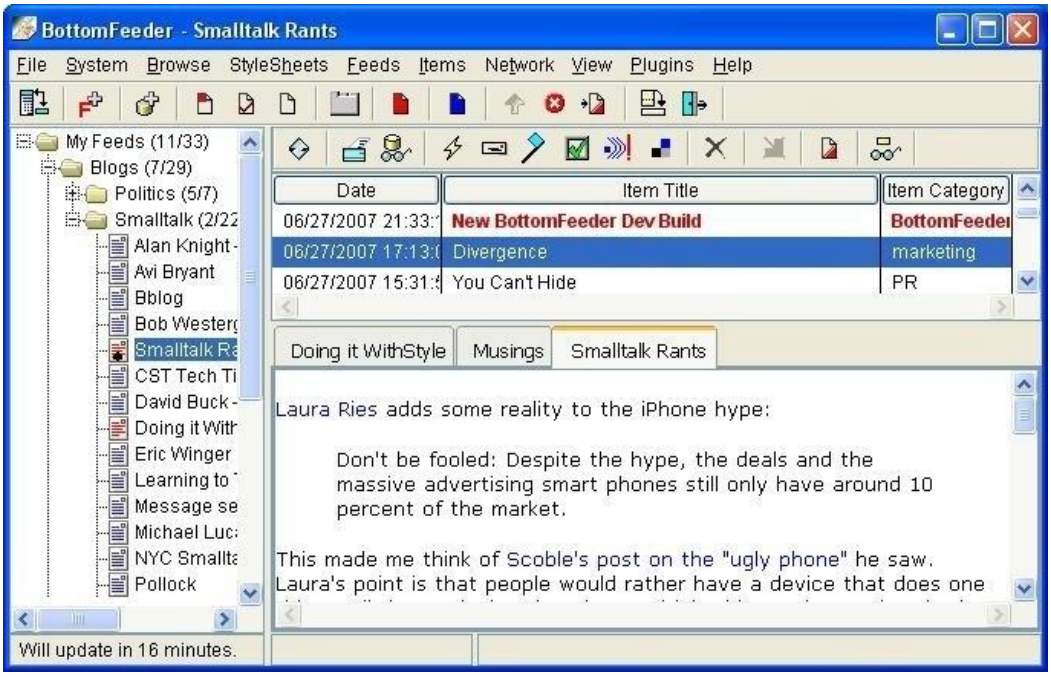


Figure 7 – BottomFeeder Interface

BottomFeeder is extensively documented, but the community surrounding it appears to have stagnated or died – the last posts on the forums date from 2007. Its interface, while fully featured, is cluttered and unintuitive. As such, it would be a difficult platform on which to develop the Mindful Reader.

	Description	Score
Modifiability	Modify existing code	3
Language (Familiarity)	Smalltalk - Poor	1
Feed Parsing	Full	5
Article Rendering	Custom renderer	4
Multiplatform	Mac/Win/Linux (and more)	5
Dev Support	SourceForge, documentation	3

Table 4 – BottomFeeder Project-Relevant Features

2.4.5 Ground-Up Development

Existing applications, while providing many useful features, could also be difficult to adapt to the purposes of the Mindful Reader project; they might prove difficult to instrument, and several are implemented in unusual languages that would require extra development effort.

It would be possible to develop from scratch in either C++ or Java, as both have established libraries for parsing XML and for GUI development. That said, many of the features provided by the existing applications (HTML rendering, feed parsing, and developer support in particular) would require much more effort to implement from the ground up. Considering that the goal of this project is to implement specific behaviors, and that development time is extremely limited, it would be wiser to focus on an existing platform that could be adapted to incorporate the necessary behaviors.

2.4.6 Feature Comparison

Table 5 shows a comparison of six different potential bases for the software based on six features. These features were each scored on a scale from one to five, with five being the best score, and each feature in turn was weighted on a scale of one to five to represent its perceived importance to the project. Modifiability and base language were of great importance to this calculation, as they would both directly impact the ease of implementation. Multiplatform support was only considered in light of potential future development.

Solution Name	Modifiable	Language	Feed Parsing	Article Renderin	Multi platfor	Dev Support	**Total Score**
C++ from scratch	5	4	2	2	2	2	63
Java from scratch	5	5	3	3	3	2	75
RSSOwl	3	5	5	5	5	4	**87**
Thunderbird	2	1	5	5	5	5	69
RSS Bandit	3	3	5	3	1	4	69
BottomFeeder	3	1	5	4	5	3	65
Feature Weighting	5	4	4	3	1	3	

Table 5 – Application Feature Comparison

Judged purely in terms of features, RSSOwl appeared to be the most appropriate solution for the Mindful Reader project, and so it was selected as the basis for the implementation.

3 Methodology

The Mindful Reader project went through three relatively distinct phases: design, implementation, and testing. In addition to the usual debugging, the testing phase also featured user evaluations of the software and its progress towards meeting the original design requirements.

3.1 Design

The software design was driven by the technical requirements for the software (visible in Section 3.2.1) and by the project's broader goals.

3.2 Development

The Mindful Reader was developed through a standard Agile-style iterative development process (Pollice 2007). The iterations proceeded as follows:

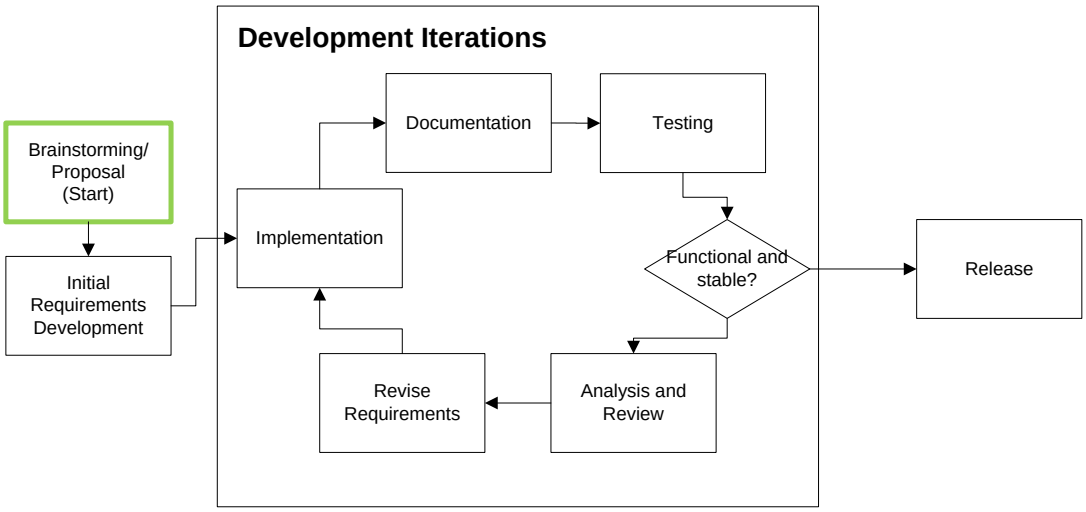


Figure 8 – Iterative Development Process

Section 5 discusses the details of the individual iterations in the implementation. The first three iterations were not public releases, as they were not fully functional; the fourth and fifth iterations served as the alpha and beta releases, respectively.

3.2.1 Requirements

The major requirements for the Mindful Reader software revolve around the novel components in the learning, ranking, and user interface categories. The baseline aggregation functionality was fully provided for by the RSSOwl codebase.

Each requirement had three levels of development: a 'stub' implementation that offered no useful functionality (but meshes with the rest of the program as a placeholder), a 'basic' implementation that offered unpolished but useable functionality, and an 'extended' implementation that offered full functionality above and beyond existing offerings.

The requirements are also scored according to importance and difficulty on a scale of one to five, with one representing the least difficult or important possible requirement and five representing an

extremely difficult or important requirement. Table 6 shows the major requirements for the Mindful Reader. The final achieved level of implementation for each requirement is displayed in bolded text.

Table 6 – Software Requirements

Category	Difficulty	Importance	Description	Stub	Basic	Extended
Filtering	5	5	Predict interest rating for new articles	Assign default interest rating	Naïve Bayes classifier	**Tweak to handle 0-frequencies, etc.**
Filtering	4	3	Duplicate detection	**Pass by default**	Compare document vectors directly	Compare w/tuned duplicate threshold
Interest Rating	3	4	Explicit user interest measurement	Text box control	**Slider control**	Slider control integrated w/implicit interest
Interest Rating	5	3	Implicit user interest measurement	Base on viewing time	Base on Curious(er) Browser metrics	**Weight + normalize metrics**
Interest Modeling	3	5	Decompose articles into vectors	Insert all terms singly	Count term frequencies	**Blacklist terms**
Interest Modeling	4	5	Store data on Informative Terms	Data structure stubs	Add methods for simple analysis	**Manage frequency-by-date list per-object**
Upkeep	4	4	Informative Terms database upkeep	Initialize to blank database	**Save database at end of each session**	Lower weighting on ignored-article terms
User Interface	4	3	Article content preview system	**Show article rating (predicted)**	Expand to show text preview	Image thumbnails

Some high-difficulty requirements, such as article duplicate detection, were not fully implemented because they were not critical to the goals of the project. Others, such as the augmentation of the user interface, were not implemented because they proved to be prohibitively difficult, given the structure of the existing RSSOwl code.

The evaluation phase introduced a new requirement, not related to the functionality of the software itself: instrumentation. Both the alpha and beta releases were designed to record certain information about user interactions with the software. This recording capability is discussed in section 6.

3.2.2 Testing and Debugging

It was beyond the scope of this project to develop for a large number of platforms simultaneously; while the RSSOwl software is available on the Mac OS X and Linux platforms, the two public testing releases for this project were built to run on the Windows operating system.

Testers were provided with access to a form that they could fill out and submit in the case of crashes or erratic behavior; this form requested the following information:

Type of Error

Crash – Program closes unexpectedly, possibly with an error message.

Hang – Program stops responding to input but does not close on its own.

Malfunction –The program continued to function, but behaves in unexpected ways or loses some data.

Component

Interface – Something that you look at (articles, previews, etc) or click on (navigation system, subscription setup) wasn't working correctly.

Database – Articles from previous sessions are not being saved properly or are not accessible.

Minder – Article suggestion/ranking system is malfunctioning (promoting nonsensical/uninteresting articles, high volume of articles, or no articles at all)

Web – Failing to download new content or correctly subscribe to feeds.

Description of Problem

A detailed description of conditions surrounding the error and the specific behavior of the program during the error, including any program or OS error messages and data lost due to the problem. If the problem has occurred multiple times, try to estimate its frequency.

These bug reports will be used to identify problems within the code and estimate the severity of those problems; the bugfixes will be scheduled for the next development iteration according to their severity, importance, and expected difficulty.

3.3 Evaluation

To succeed, this project needed to offer existing RSS reader users tangible benefits over their present preferred client software, and it needed to offer new users compelling reasons to continue using it on a regular basis. The software was tested to gather data on real-world performance. In addition, it was developed to the point that all software requirements rated with importance "4" or higher were satisfied at the basic or extended level.

3.3.1 Evaluation Methodology

In addition to the completion of the software requirements, the Mindful Reader must actually provide benefits to users in real-world situations by correctly promoting interesting articles and demoting uninteresting articles. There are two indicators of successful ranking: a correlation between predicted article ratings and user-specified article ratings (implicit and explicit), and the difference between ratings predicted for read and unread articles.

The beta test build of the Mindful Reader software was instrumented to record this information after each session. The full details of the test can be seen in section 6.2.

3.3.2 Evaluation Survey

The testers involved in both the alpha and beta tests were each requested to complete a short survey about their experience. The surveys requested data that could not be directly observed during the testing sessions, such as comparisons between the perceived time demands of the

Mindful Reader software and of other aggregator software. They also requested feedback on the software's stability and usability. The alpha test survey and its results can be seen in section 6.1.4

3.4 Project Management

This project was managed through weekly meetings. Each meeting covered several items:

- work accomplished during the past week
- goals for the next week
- discussion questions
- reading/background references
- new data or products, including
    - experimental results
    - report segments
    - new software builds

These topics were summarized in progress reports, which can be seen in Appendix E.

3.4.1 Schedule

The schedule is divided into six phases: the initial planning/design phase, three major development iterations, a testing/evaluation phase, and a final writeup and documentation phase. The report was developed continuously alongside the project itself. Section 5 was largely written during the development iterations, and section 6 was updated alongside the alpha and beta tests of the software.

As the project progressed, some elements of the schedule changed. Not all of the originally scheduled implementation work was ultimately necessary, given new knowledge of the inner workings of the RSSOwl code. In addition, the testing and evaluation phase was altered to accommodate both the alpha and beta tests, rather than the originally-planned ongoing single test of the software.

The full project schedule is visible in Table 7. Note that the week column has been color-coded to represent WPI's term schedule, with blue for B08, green for C09, and red for D09.

Table 7 – Weekly Schedule

Week	Phase	Major Weekly Goals
10/27/2008	Planning and Design	Set up website, begin work on proposal/report
11/3/2008		Schedule, draft requirements, continue proposal/report
11/10/2008		Contact prominent RSS aggregator projects for insight, work on proposal/report
11/17/2008		Finish proposal draft of report
11/24/2008		Submit draft proposal/report, prepare for development
12/1/2008		Further research, revise report based on criticisms
12/8/2008		Set up dev environment, revise report based on criticisms
12/15/2008		Explore RSSOwl architecture, final draft of paper
1/12/2009	Development Iteration 1	Implement stub functionality
1/19/2009		Implement rating singleton, begin UI extensions
1/26/2009		Create data structures for doc vectors, informative terms
2/2/2009		Proof-of-concept w/explicit interest only
2/9/2009	Development Iteration 2	Persistent storage of interest model, work on prediction algorithms
2/16/2009		Begin tracking implicit interests, work on prediction algorithms
2/23/2009		Extend interest model to track rating distributions
3/2/2009		Extend implicit interest inference mechanism
3/16/2009	Testing and Evaluation / Final Iteration	Finalize alpha release package (installer, experimental data recording)
3/23/2009		Release via email/website, work on initial bugs/configuration problems
3/30/2009		Collect alpha test data, update software for beta release, work on report
4/6/2009		Analyze alpha test data, package beta release, work on report
4/13/2009	Final Writeup and Polishing	Beta release; discuss alpha test data and analysis in report, prepare presentation
4/20/2009		Collect & analyze beta test data, work on presentation & report
4/23/2009		Present, continue polishing + updating report
4/30/2009		Final report due

The testing phase was unfortunately truncated from its original length, in part because of the final report deadline. The original schedule, drafted in term B08, assumed roughly an additional week for testing because the end of the term proper was scheduled for May 5th.

4 Software Design

The Mindful Reader project is intended to produce a feed aggregator program that is faster and more convenient to use than a conventional aggregator system. It has several major enhancements to the typical design to facilitate this goal. This section documents those enhancements and describes how they function together with the baseline RSSOwl platform.

4.1 RSSOwl Architecture

The Mindful Reader client software is an extension of the open-source RSSOwl project (Pasero 2008). RSSOwl provides all of the necessary baseline functionality for a feed aggregator: it can parse feeds in several formats, render articles via an embedded browser, and subscribe to new feeds.

The underlying architecture is conveniently organized. RSSOwl is divided into six modules. Four of these modules are library modules that provide useful extensions and functionality for the system, and two of them encapsulate the program's core functionality and interface. The six modules are described below.

4.1.1 org.rssowl.core module

As the name suggests, this module encapsulates the core functionality of the RSSOwl program. This module contains object representations of the logical entities (feeds, bookmarks, folders, user actions) required for a user to manage and interact with an aggregator.

This module has been extended in several ways:

- The News class and the INews interface (which store and provide access to article data in RSSOwl) have been extended to support article ratings.
- A MindfulInterests singleton class has been added to store the Informative Terms Database (see section 4.3).
- A MindfulRater singleton class has been added to encapsulate article-rating methods.
- A MindfulDocVector class has been added for turning articles into document vectors; it supports term blacklisting (see section 4.4).
- A MindfulTerm class has been added to store data about informative terms found during the rating process (see sections 4.4 and 4.3).

4.1.2 org.rssowl.lib.db4o module

This module contains the *db4o* (http://www.db4o.com/) library, a native Java/.NET open source object database developed and maintained by Versant Corp. It allows one to store Java objects in a database. RSSOwl itself uses db4o to maintain persistent objects, such as feed subscriptions and news articles, between use sessions. The Mindful Reader stores some additional information in the extended News objects, which are in turn saved to the db4o database and maintained between sessions.

4.1.3 org.rssowl.httpclient

This library module holds *HttpClient*, a library that provides Java with more robust HTTP functionality (http://hc.apache.org/httpclient-3.x/). It is not used by the Mindful Reader project

directly. RSSOwl uses it to handle secure connections and other HTTP features not provided for by the java.net packages.

4.1.4 org.rssowl.lib.jdom

The JDOM library is a "complete, Java-based solution for accessing, manipulating, and outputting XML data from Java code." (http://www.jdom.org/). RSSOwl uses it to parse feeds, as popular feed formats such as RSS and Atom are all based on the XML standard. The Mindful Reader does not make use of this library directly, instead working through the already-parsed feed objects provided by RSSOwl itself.

4.1.5 org.rssowl.lib.lucene

This module encapsulates the *Apache Lucene* library, a "high-performance, full-featured text search engine library written entirely in Java." (http://lucene.apache.org/java/docs/). RSSOwl uses this to index the text of articles for searching and filtering.

4.1.6 org.rssowl.ui

This module houses all of RSSOwl's user interface classes. All of the forms, dialogs, and controls that the user can see and interact with are found here. The Mindful Reader extends several of these classes:

- The "NewsTableControl" class, "NewsTableLabelProvider" class, and the "NewsTableViewer" class are extended to allow for articles to be ranked by interest rating.
- A RatingBar class has been added, which allows the user to rate articles.
- The "WebBrowserView" class is extended to record user actions when interacting with articles (see section 4.2).

4.2 User Behavior Monitoring and Input

The user of the Mindful Reader software can begin browsing articles as soon as they are downloaded and given a predicted rating by the User Interest Model. As soon as the user clicks on an article to view its contents, the Mindful Reader will begin monitoring the user's behavior, in an attempt to gauge the user's interest in the article contents.

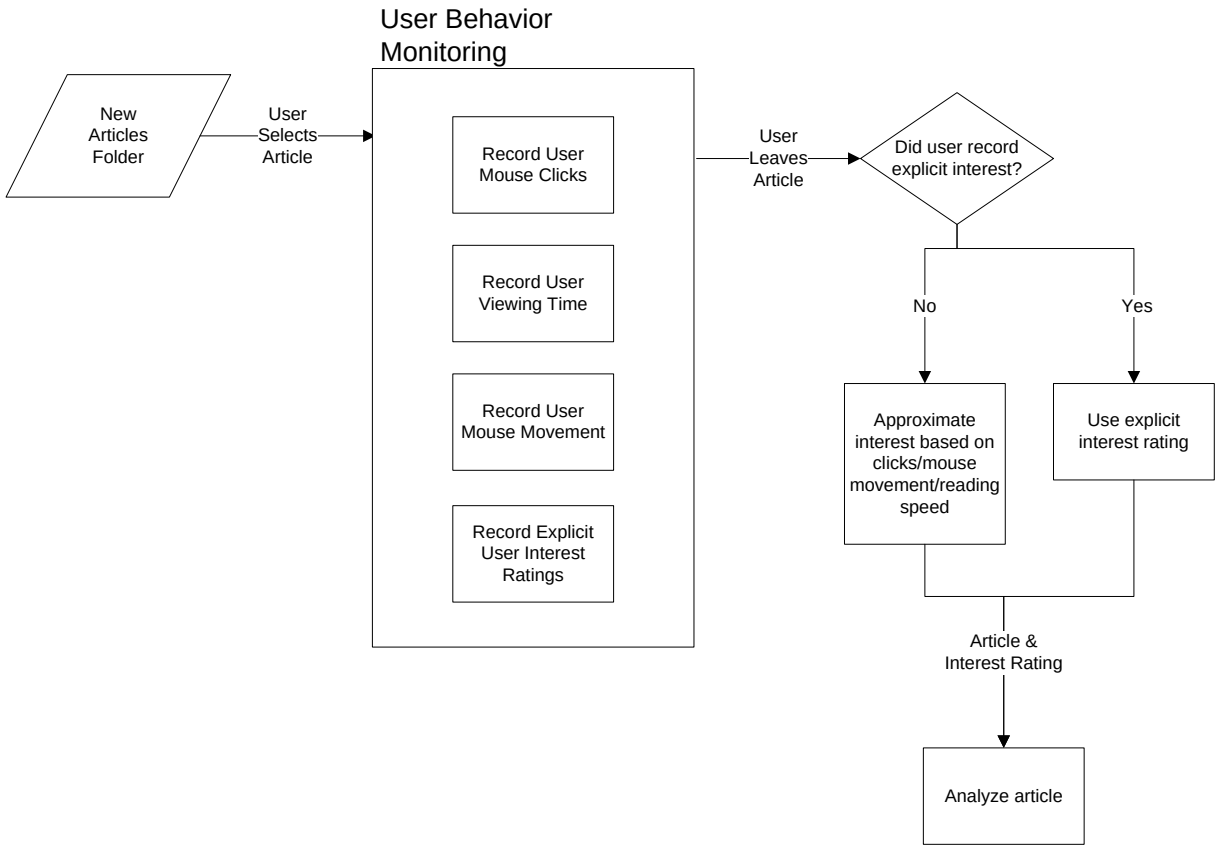


Figure 9 – User Behavior Monitoring and Input Flowchart

As seen in the "User Behavior Monitoring" block in Figure 9, the Mindful Reader tracks three implicit-interest metrics:

- Mouse clicks (normalized against number of clickable elements – links or multimedia content – contained in the page)
- Scrolling (normalized against length of scroll bar – not used in rating if the article fits on the page)
- Reading speed (calculated as characters-per-minute from the article viewing time and length, normalized against a threshold reading speed, and inverted so that the score is lowest when the user barely reads a given article)

These metrics are combined at the end of the article viewing to calculate the user's implied interest in the article, via the algorithm seen in Figure 10.

$$Interest_{implied} = \frac{W_c \frac{MouseClicks}{ClickableElements} + W_m \frac{MouseMoveAmt}{MouseNormal} + W_v \frac{ReadingSpeedThreshold}{\frac{ViewingTime}{ArticleSize}}}{W_c + W_m + W_v}$$

$$MouseNormal = ViewPanelWidth + \frac{TotalArticleLines}{ViewPanelLines} * ViewPanelHeight$$

Figure 10 – Implied Interest Formula

The formula itself is a simple weighted average. Each of the three metrics has a weight (W_c for mouse clicks, W_m for mouse movement, and W_v for reading speed). The reading speed and mouse movement metrics are weighted higher, as they have a strong correlation to user interest in the content (Le & Waseda 2000); this correlation was reinforced by the results of the software alpha test, described in section 6.1.5.

All three of these components are normalized in some way, so that they provide a value between zero and one. This normalization cannot account for some unusual behavior, however. Users may, for instance, leave the article open for an extended length of time, yielding an apparently exceptionally low reading speed, or they may click elements in the article multiple times. To counter this, the individual score components are clamped such that they cannot fall outside of the zero-to-one range.

In addition to the limits placed on the individual components, the overall implicit interest rating value is restricted to a limited range itself. The final rating is clamped such that the value must fall between 0.2 (corresponding to a -1 rating from the user) and an 0.8 (corresponding to a +1 rating from the user). This is because explicit ratings must carry more weight than implicit ratings. Explicit ratings themselves have an implicit meaning: if the user cares enough to make a rating on an article, he or she likely feels more strongly about the content of the article one way or the other than if he or she simply let the implicit rating system judge engagement in the content.

The reading speed metric is the only metric of the three normalized against a value calculated from data outside of the article and reader software itself: a rough average reading speed. This average comes from a small experiment, wherein subjects were timed while thoroughly reading two articles from a newsfeed.

Table 8 – Experimental Data on Reading Speeds

Document 1 (Source: BoingBoing)			
Words:	Characters:		
274	1439		
Tester #:	Time (s):	WPM:	CPM:
1	33.1	496.7	2608.5
2	78.4	209.7	1101.3
3	76.8	214.1	1124.2
4	37.0	444.3	2333.5

Document 2 (Source: CNN)			
Words:	Characters:		
78	512		
Tester #:	Time (s):	WPM:	CPM:
1	12.9	362.8	2381.4
2	32.7	143.1	939.4
3	36.1	129.6	851.0
4	17.8	262.9	1725.8

The test revealed a fairly wide spread of reading speeds. The faster readers were able to read upwards of 2,000 characters per minute. Because of this, the Mindful Reader makes use of a relatively high threshold of 1,800 characters per minute; readers who read slower than this may

generate more false positive implicit ratings, but, in the case of building an interest model, false positives are generally preferable to false negatives that might hurt the rankings of articles in which the user is actually interested.

Unfortunately, this method does not work perfectly for very short articles; the window of time between an article being rated poorly and highly via the reading speed metric can be very small for an article consisting of only two or three sentences. As a result, the Mindful Reader is designed to provide a three-second "grace period" before it begins to count viewing time toward reading speed. This means that a user quickly skimming through a set of short articles will not accidentally give each of them an exaggeratedly high implicit rating.

The implicit rating for an article is not assigned until the user switches to viewing another article. If the user chooses to explicitly rate the article, his or her explicit rating completely overrides the generated implicit rating. Users can also come back to an article at a later time. This will not generate a new implicit rating for the article, but the user may choose to give an explicit rating at this point if they did not do so before; in this case only, both the implicit and explicit ratings will have a bearing on the user interest model.

In either situation, the user can only provide an explicit rating once, because it is difficult to redact the effects of rating an article from the Informative Terms Database. Once the user has made an explicit rating, the article rating will appear with a "*" in the article listing, and the rating bar itself will disable to indicate that no further rating is possible.

All article ratings, including implicit, explicit, and predicted ratings, are calculated and stored internally as decimal values ranging from 0 to 1. These values would be difficult for users to interpret, however, so the Mindful Reader software maps them into specific rating "classes" that are displayed to the user as discrete values, ranging from -2 to +2. Table 9 shows how these internal ratings map to the discrete values that are displayed.

Table 9 – Internal Rating to UI Rating Mapping

Internal Rating Minimum	Internal Rating Maximum	Discrete UI Rating
0.000	0.125	-2
0.125	0.375	-1
0.375	0.625	0
0.625	0.875	+1
0.875	1.000	+2

This mapping was chosen such that the extreme positive and negative ratings (+2 and -2) covered a smaller internal range than the three ratings in the middle. The user is most likely to notice ratings at these extremes, and this mapping ensures that articles with borderline positive or negative predicted ratings (discussed in section 4.4) will most likely fall in the -1 or +1 categories.

With the article rated, the Mindful Reader passes the article and rating pair off for analysis. The contents of the article can be used to update the user interest model.

4.3 Viewed Article Analysis and Storage

Once an article has been viewed and rated, it is inserted into the User Interest Model, as is shown in Figure 11.

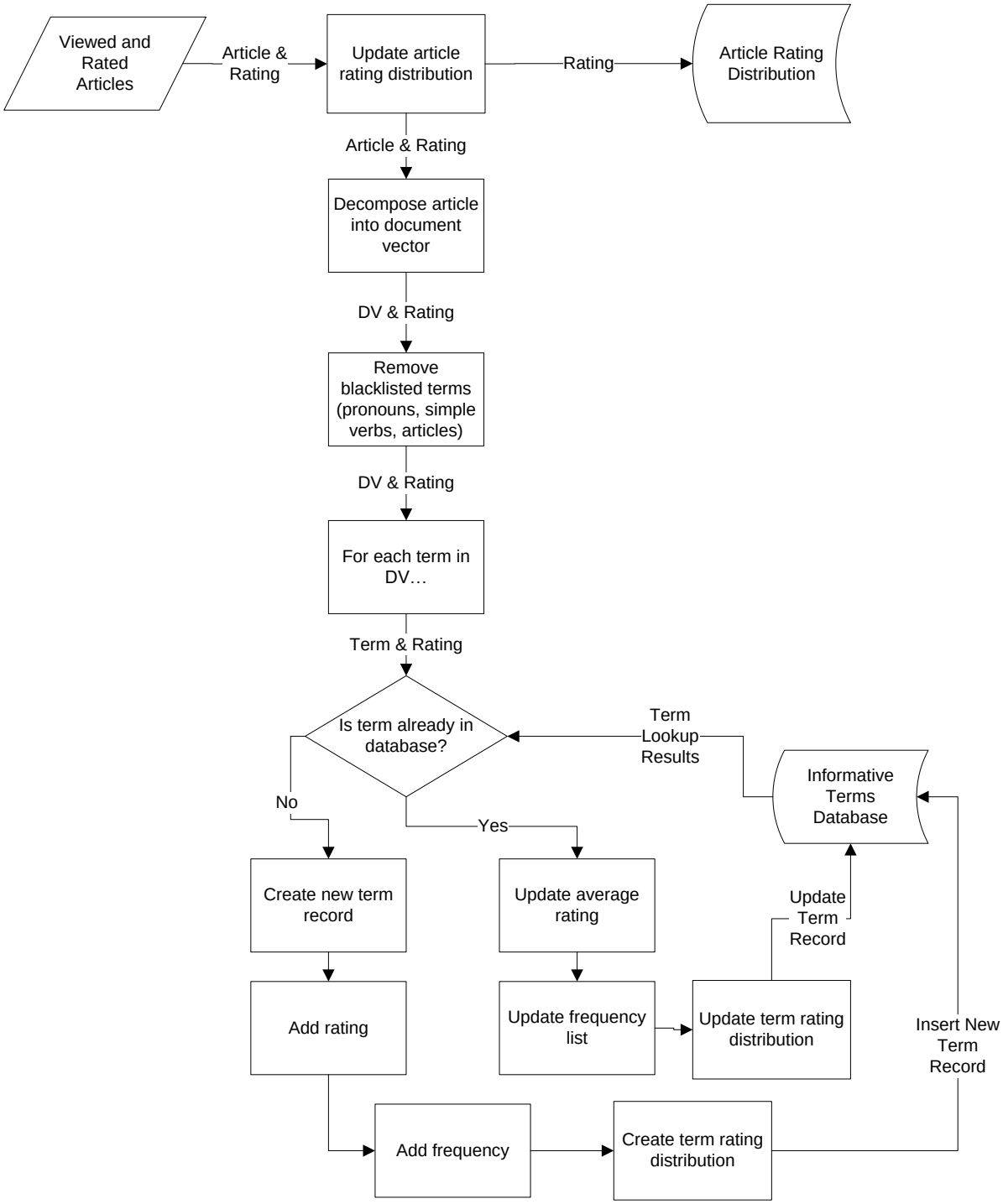


Figure 11 – Viewed Article Analysis and Storage Flowchart

Before the article itself is analyzed, the article rating is inserted into a record of the overall distribution of article ratings across the five discrete classes (-2 through +2). This information is used later by the Naïve Bayes Classifier prediction mechanism, which calculates the base probabilities for each class from this distribution.

Next, the article itself is decomposed into a document vector consisting of terms and term frequencies. The document vector below in Table 10 contains all the terms and their respective frequencies from the report abstract.

Table 10 – Sample Document Vector

Term	Frequency	Term	Frequency	Term	Frequency
the	5	to	3	article	1
mindful	1	reduce	1	ratings	1
reader	1	time	1	applying	1
project	1	necessary	1	that	1
centers	1	for	1	rank	1
on	2	users	1	incoming	1
design	1	find	1	based	1
development	1	interesting	1	predicted	1
of	1	articles	2	software	1
a	2	by	1	was	1
machine	1	building	1	developed	1
learning	1	user	3	using	1
augmented	1	interest	3	code	1
newsfeed	2	model	3	RSSOwl	1
aggregation	1	from	2	project	1
application	1	implicit	1	in	1
it	1	and	2	tests	1
seeks	1	explicit	1	grew	1
more	1	with	1		
accurate	1	time	1		

When constructing a document vector from an article, the Mindful Reader inserts all terms in the article description, as well as the article title and the author, if the latter is specified. The author and title can be particularly important information when rating an article, since some feeds only provide short two- or three-sentence summaries for their descriptions, rather than full article text.

The Mindful Reader also performs some additional processing steps at the document vectorization stage. Terms containing non-alphanumeric symbols such as pound signs and backslashes are dropped, as they are most likely markup that has little bearing on the content of the article. All terms are reduced to lower case. While in a few cases capitalization can convey information (such as the difference between “the white house on the left” and “the White House”), these are the exception. Parsing the text to understand these distinctions is beyond the scope of this project.

Finally, any terms that appear on a pre-defined blacklist, often called a "stop list," are dropped from the document vector. These terms include:

- Prepositions (on, of, from, etc.)
- Pronouns (he, she, it, they, etc.)
- Articles (a, an, the)
- Basic verbs (to be, to go, to do, etc.)
- Conjunctions (and, or, but, etc.)
- Numbers (one through ten and common resolution values)
- HTML markup (tags, URLs, etc)
- Variations on the above (contractions and abbreviations)

The blacklisted terms are removed because they provide no extra informative power to distinguish between interesting and non-interesting articles. Basing ratings on these terms would slow down the rating algorithm and introduce additional noise into the final rating. Table 11 below shows the document vector for the report abstract again, this time filtered to remove blacklisted terms. The filtered list is shorter, and therefore easier to store. More importantly, it conveys effectively the same information as the previous document vector, since most of the terms removed existed only to provide syntactic structure that the document vector does not record.

Table 11 – Blacklist-Filtered Sample Document Vector

Term	Frequency	Term	Frequency	Term	Frequency
mindful	1	necessary	1	incoming	1
reader	1	users	1	based	1
project	1	find	1	predicted	1
centers	1	interesting	1	software	1
design	1	articles	2	developed	1
development	1	building	1	using	1
machine	1	user	3	code	1
learning	1	interest	3	RSSOwl	1
augmented	1	model	3	project	1
newsfeed	2	implicit	1	tests	1
aggregation	1	explicit	1	grew	1
application	1	article	1	accurate	1
seeks	1	ratings	1	time	1
reduce	1	applying	1		
time	1	rank	1		

The system may require additional modifications to efficiently deal with languages that make use of portmanteau words or contractions, and it may also need modifications to successfully parse components of some languages represented with extended character sets like Unicode. For the purposes of this project, only English words are filtered. The filter is stored as a simple whitespace-delimited word list, so it should be easy to extend or replace the list for alternate localizations.

Next, the individual terms from the document vector are inserted into the Informative Terms database. This database is stored internally as a hashmap, so that information on a given term can be looked up quickly. The terms themselves are used as the keys. Table 12 shows a sample complete term record from the database. New terms that do not currently exist in the database are inserted as-is, with just the weighting (equivalent to the article rating) and frequency information from the current article. The rating distribution is initialized to 0 for every class of ratings (as mapped earlier in Table 9) except the class of the current article, which is initialized to 1.

Table 12 – Sample Informative Term Record

		Term Frequency/Session List (Max 15 elements)				
Term	**Weight**	**Frequency (12/8/2009)**	**Frequency (12/7/2009)**	**Frequency (12/6/2009)**	**Frequency (12/5/2009)**	**Frequency (12/2/2009)**
defenestrate	0.94	25	34	41	2	1
		Rating Distribution				
		-2	**-1**	**0**	**+1**	**+2**
		0	2	1	40	60

Existing terms are updated by averaging the article rating with the term's existing weighting. This average is itself weighted: if the term has appeared in several sessions, the old weighting will be valued more than the new, since user interest in the term is not likely to change dramatically over the course of one article. Figure 12 shows the formula used to calculate the new weight; in it, the *length(freqlist)* term is the length of the Term Frequency/Session List seen in Table 12.

$$weight_{new} = \frac{rating + length(freqlist) * weight_{old}}{1 + length(freqlist)}$$

Figure 12 – Term Weighting Calculation

The term frequency is also inserted into the list of term-frequencies-by-session, unless the term has already appeared in the same session. In the latter case, the session frequency is updated. Finally, the rating distribution for the term is updated by incrementing the rating class into which the current article falls.

If the term frequency would grow beyond 15 elements, the oldest frequency data in the list is dropped. This has the effect of causing the Mindful Reader to gradually forget old frequency data to match the user's current reading habits.

4.4 New Article Rating and Insertion

When RSSOwl checks its subscribed feeds for new items, the resulting articles are passed to the Mindful Reader extensions to the core module. These extensions process the articles, rating them based on the user interest model.

Figure 13 shows the steps in which incoming articles are processed. When new articles are fully parsed by the base RSSOwl code, they trigger an event that is intercepted by the Mindful Reader extensions. At this point, the articles are submitted to the User Interest Model singleton for rating.

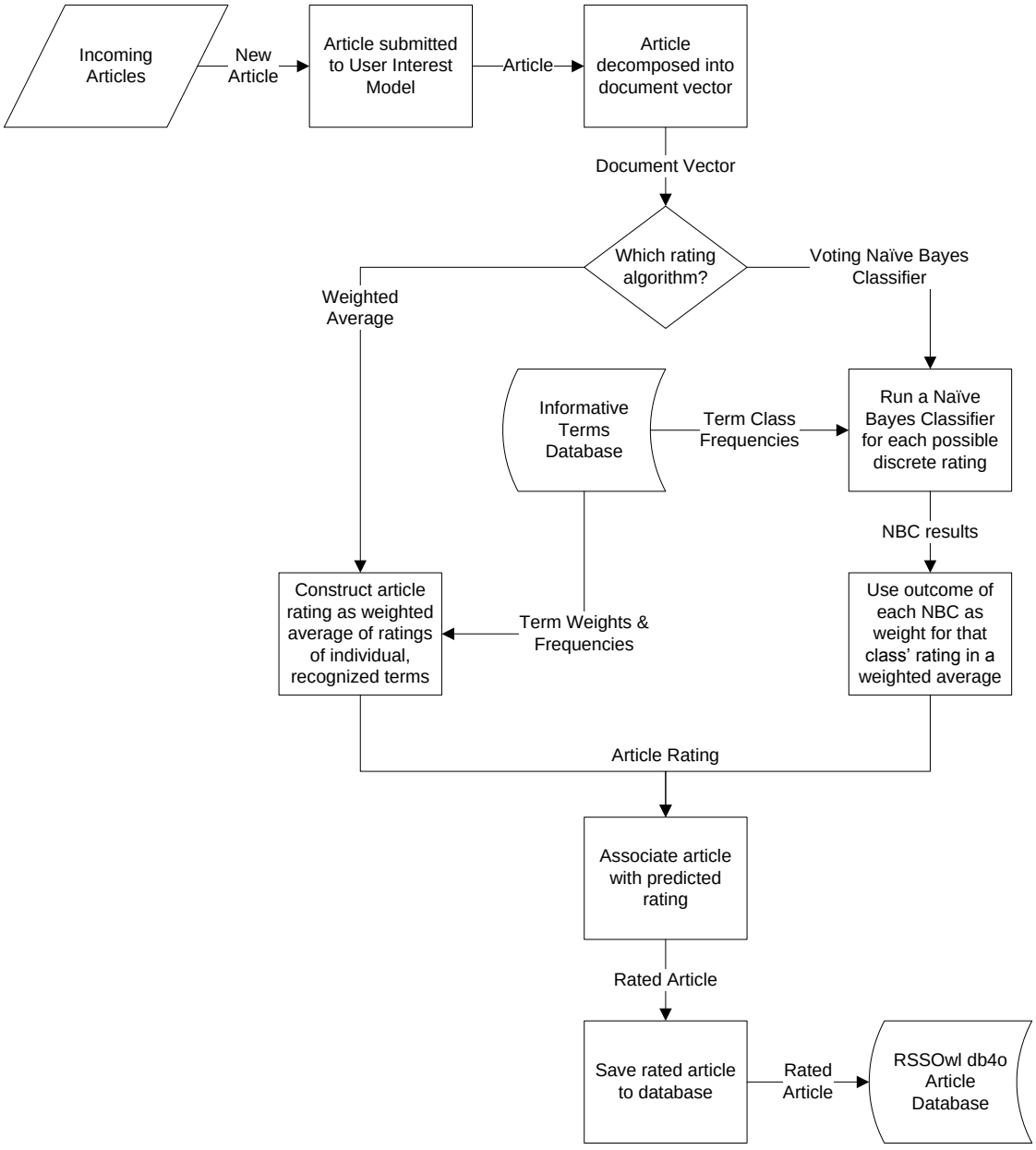


Figure 13 – Article Rating and Insertion Flowchart

For the first step in the rating process, the articles are decomposed into document vectors, as described previously in section 4.3. With the article reduced to document vector format, the User Interest Model can generate a predicted rating for the article using one of two implemented algorithms. Both algorithms yield a decimal predicted rating between 0 and 1. These values map to a series of discrete ratings that are displayed to the user, as seen previously in Table 9.

The first method of calculating a predicted rating for a document involves constructing the rating as a weighted average of the known weights of each document term that also exists in the Informative Terms Database. The algorithm is as follows:

$$R_{AVG} = \sum_{i=0}^{n} \frac{weight(term_i)}{count_i}$$

Figure 14 – Weighted Average Rating Algorithm

where *weight(term)* provides the historical average weight of articles in which the term has appeared (obtained from the Informative Terms Database), $term_i$ provides the *i*th term in the document vector, $count_i$ provides the frequency of the *i*th term in the document vector, and *n* is the number of unique terms in the document vector.

This method yields a reasonable prediction for an article rating, and it has the advantage of producing reasonable predictions with only few articles inserted into the Informative Terms Database. Unfortunately, it also has multiple flaws. First, it does not take into account the historical frequency with which the terms appear. Terms that have been seen more frequently across all articles may be more reliable indicators of value. In addition, this algorithm tends to produce ratings compressed toward neutral, or 0.5; this is not a problem when the individual terms are historically close to 0.5, but the algorithm would treat such an article as equivalent to one with a wide spread of term weights.

Because of these shortcomings, the User Interest Model can also base ratings on a second algorithm. This algorithm uses a series of Naïve Bayes Classifiers – one for each of the five discrete rating values that a user can explicitly assign to an article. The algorithm was originally intended to use only one Naïve Bayes Classifier, similar to the system used by Billsus and Pazzani (2000). While that approach worked well when the user was limited to a binary choice ("interesting" or "not interesting"), it did not extend well to a continuous scale of interest ratings.

$$P(article|class) = k * p(class) * \prod_{i=0}^{n} \left(\frac{frequency(term_i, class)}{frequency(term_i)}\right)^{count_i}$$

Figure 15 – Naïve Bayes Classifier

The algorithm in Figure 15 can be used to calculate probability that an article falls into a given class, by calculating the product of the probabilities of each of term instance occurring in an article of that class. As before, *n* is the number of unique terms in the article. The algorithm above contains an additional term, *k*, representing the probability of an article existing with the given set of terms. *k* is difficult to calculate accurately, and since it will be the same regardless of article class, it can be safely dropped. The *p(class)* term represents the initial probability of any article existing within a given class; these class probabilities may vary from user to user, so the Mindful Reader software tracks the distribution of all article ratings across the classes.

With the probabilities for each class calculated, these probabilities are then normalized so that they add to 1, and used to construct a rating. For the purposes of the math, it is convenient to label the five classes (from -2 to +2) as classes zero through four. Each classifier contributes a portion of the final rating, effectively voting on the outcome: the class 4 classifier contributes a portion rated at 1, the class 3 classifier contributes a portion rated at 0.75, and so on.

$$sum_p = \sum_{i=0}^{4} p(article|class_i)$$

$$R_{NBC} = \sum_{i=0}^{4} \frac{p(article|class_i)}{sum_p} * \frac{i}{4}$$

Figure 16 – Voting Naïve Bayes Classifier Rating Algorithm

Unlike the weighted-average algorithm, the classifier-based algorithm does not function well when paired with a small Informative Terms Database. It works best when it has a set of class distributions for each term that show with some accuracy how likely the term is to fall within one category or another. In light of this, the best rating system to use may actually be a hybrid model: rate articles with the weighted average method until the Informative Terms Database reaches a certain size, and then transition into ratings using the classifier-based algorithm.

With the article rated by one of the two methods, all that remains is for the Mindful Reader to associate the rating value with the original article object. To do this, the article object must be updated with the rating, and then saved to the db4o article database. This allows other components of the base RSSOwl architecture to access the new rating value, and, in the case of the user interface, display that value.

4.5 Post-Session Upkeep

Following each use session, the Mindful Reader must go through a shut-down period to record persistent data and maintain the user interest model databases.

4.5.1 Database Upkeep

The user interest model is stored in a persistent file, so that it can be maintained and updated between use sessions. In the present implementation of the Mindful Reader software, this file is simply a plain text file recording the article rating distribution and the set of term records included in the Informative Terms Database. This data is written out in its entirety at the end of each session, as the individual term records are highly volatile. The data is stored in plain text for ease of debugging; in future iterations, it might be preferable to store records either in an XML-schema-based file, or in a more compact (but non-human-readable) binary format.

Because the user interest model is only saved at the end of a use session, there is a reduced risk of the software crashing and corrupting the persistent database during an update; still, the database might become damaged if the shutdown process itself was interrupted by a crash or power failure. This method also places users who leave the software on constantly at some risk of losing large amounts of interest model data. To counteract these problems, the system might be amended to

periodically save the user interest model data, and to keep a backup of the database file in case of corruption.

4.5.2 Experimental Data Recording

As with the user interest model, the experimental data recorded by the Mindful Reader is stored in a plain text file. Unlike the user interest model data, however, the experimental data is saved by appending to an existing file, since the experimental data from previous sessions does not change after it is recorded. Each set of experimental data is preceded by a header that records the time of the session ending and the number of data entries, so that the data can be automatically parsed and tied to specific use sessions. The actual experimental data recorded during the evaluation phase varied from test to test, and the details on these tests can be seen in section 6.

5 Implementation

The Mindful Reader software was implemented during C term of 2009.

5.1 Iteration One

The first iteration of the Mindful Reader was scheduled for completion during the week of February 2, 2009. This iteration focused on the following components:

- RSSOwl UI extensions for explicit user content ratings and rating display
- Extensions to feed-related classes to allow for article ranking

The original design called for direct modification of RSSOwl components, but it quickly became clear that a more modular design would greatly benefit the project. Mindful Reader-only code was separated into two new packages. org.rssowl.core.mindful was added for Mindful Reader databases and classes (rater algorithm, document vectors), while org.rssowl.ui.mindful was added for new UI components such as the article rating bar.

The UI changes for this iteration were minimal and functional. As seen below in Figure 17 – Mindful Reader, Iteration 1 Screenshot, the major additions consisted of a 'Rating' column denoting each article's numerical rating (on a scale from 0 to 1), and the 'Rating' bar above the article proper, allowing users to enter an explicit rating.

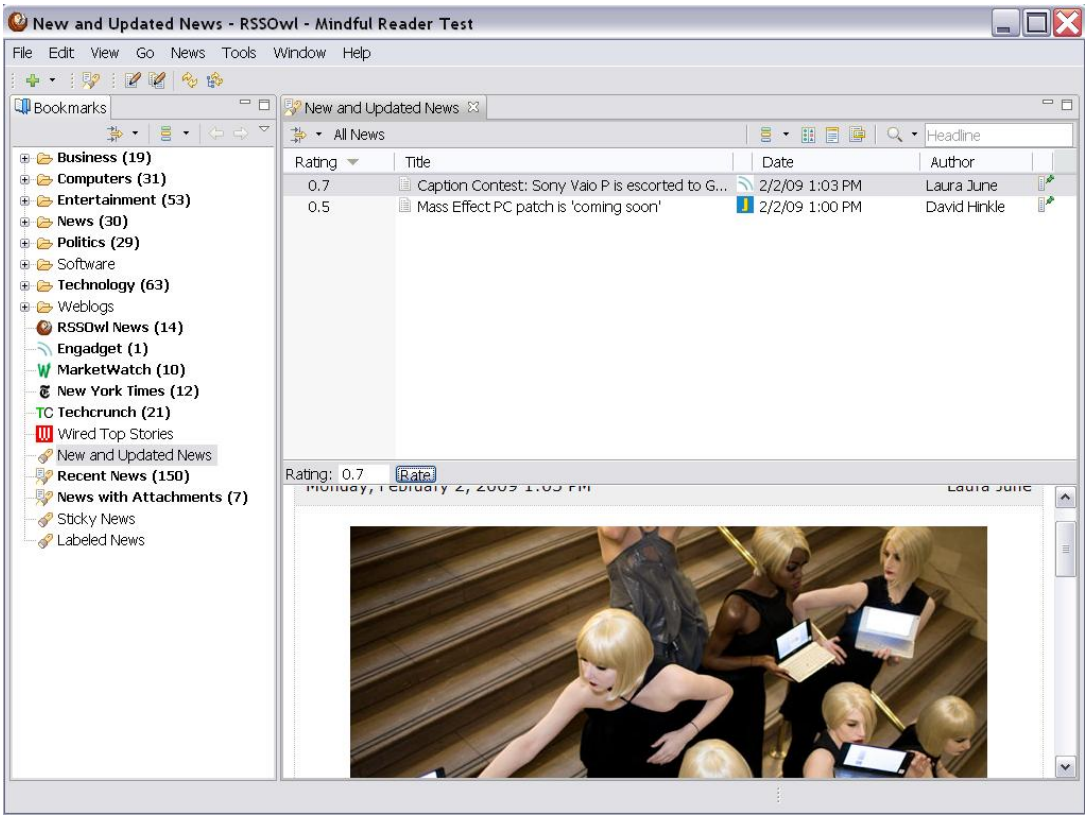


Figure 17 – Mindful Reader, Iteration 1 Screenshot

This iteration of the Mindful Reader was functional, insofar as it could build a simple user interest model from explicit user ratings of articles. It could construct stoplist-filtered document vectors for incoming articles, and then rate the incoming articles based on the naïve Bayes classifier discussed in 4.4.

Early testing with this iteration showed that the classifier yielded a bias towards short articles. Since the classifier built its rating from a product of probabilities, each successive term in a given article lowered (or at best maintained) the current rating-to-date.

5.2 Iteration Two

The second iteration of the Mindful Reader was scheduled for completion during the week of February 23, 2009. This iteration focused on the following components:

- Persistence of term database and article ratings;
- Algorithm testing/refining;
- Further UI enhancements;
- Implementation of basic implicit rating inference.

This iteration focused on the development of two article-rating algorithms: one based on the Naïve Bayes Classifier (NBC), and one based on a simple weighted average of the interest terms found in the article. In internal testing, the NBC algorithm behaved erratically when compared to the average-based algorithm. Previous news classification systems generally had the user provide a binary response ("interesting" or "not interesting"), mapping well to the NBC, which determines the probability that a given document falls into a single class. It became apparent that article ratings do not map directly to the probability-of-interestingness that the NBC needs for input.

During this iteration, many of the core Mindful Reader extensions were made persistent between use sessions. The informative term database was implemented as a simple text file, listing each term with its frequency history and weighting value. This database is loaded at the start of each session and saved at each session's close. Some other elements were made persistent through the existing architecture of the RSSOwl system; for instance, the three recorded ratings for each news article (predicted, implicit, and explicit), were set to be stored in the db4o database already used for article persistence in the standard RSSOwl software.

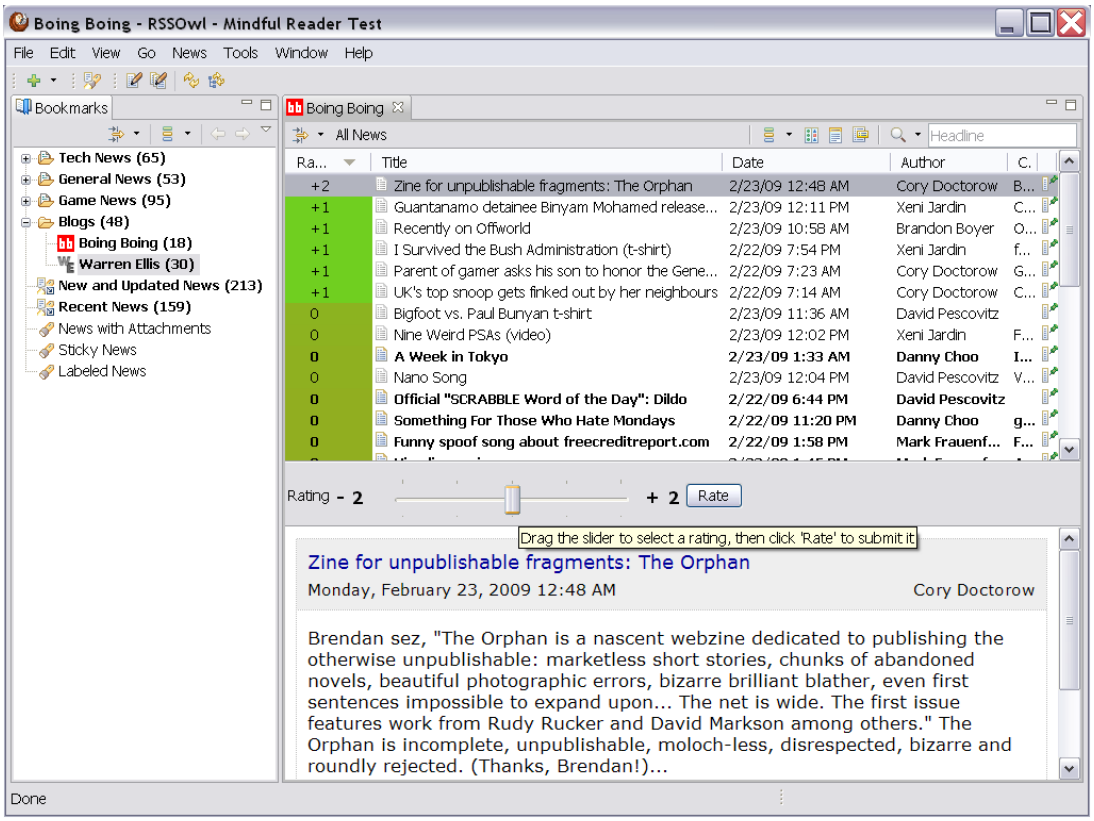


Figure 18 – Mindful Reader, Iteration 2 Screenshot

The interface was greatly enhanced in this iteration, as seen in Figure 18; the enhancements included:

- A rating slider for easier submission of explicit article ratings;
- Tooltip text on the rating slider and the "rate" button to explain the article rating process;
- A readable value system for the ratings, ranging in discrete increments from -2 to +2;
- Color-coded backgrounds to provide finer-grained information on article ratings.

5.3 Iteration Three

The third development iteration of the Mindful Reader was the final iteration prior to public release. This iteration looked similar on the surface, but featured a number of changes in the underlying code. The largest change was the introduction of interchangeable interest model algorithms: by changing a configuration property, it was possible to utilize one of three algorithms, including a simple Naïve Bayes Classifier algorithm and the weighted average and voting Naïve Bayes Classifier algorithms described in section 4.4.

This iteration was also the first to maintain full persistence of data across sessions. Previously, article ratings (predicted, implicit, and explicit) did not reliably persist across use sessions. This turned out to be because the rating data was not always being saved to the RSSOwl article database; the problem was resolved by forcing the article to save following every rating update.

Finally, this iteration introduced the implicit rating system to measure user engagement in articles, based on three metrics:

- Reading speed;
- Mouse clicks within article;
- Mouse movement over article.

At this point, however, the normalization techniques for the three metrics were not fully implemented.

5.4 Alpha Release

The first public release of the Mindful Reader software was packaged with a full installer and instrumented to record article rating data, as described in section 6.1. This release featured some small UI improvements, such as the rating increment and decrement buttons visible in Figure 19. The release also introduced a new form of feedback for explicit ratings: after the user provided an explicit rating for an article, the rating bar would visibly grey out and become disabled, communicating the rate-once nature of the explicit rating mechanism. The rating bar reverted to its enabled state when the user navigated to an unrated article; it also became disabled if the user navigated to any previously rated article.

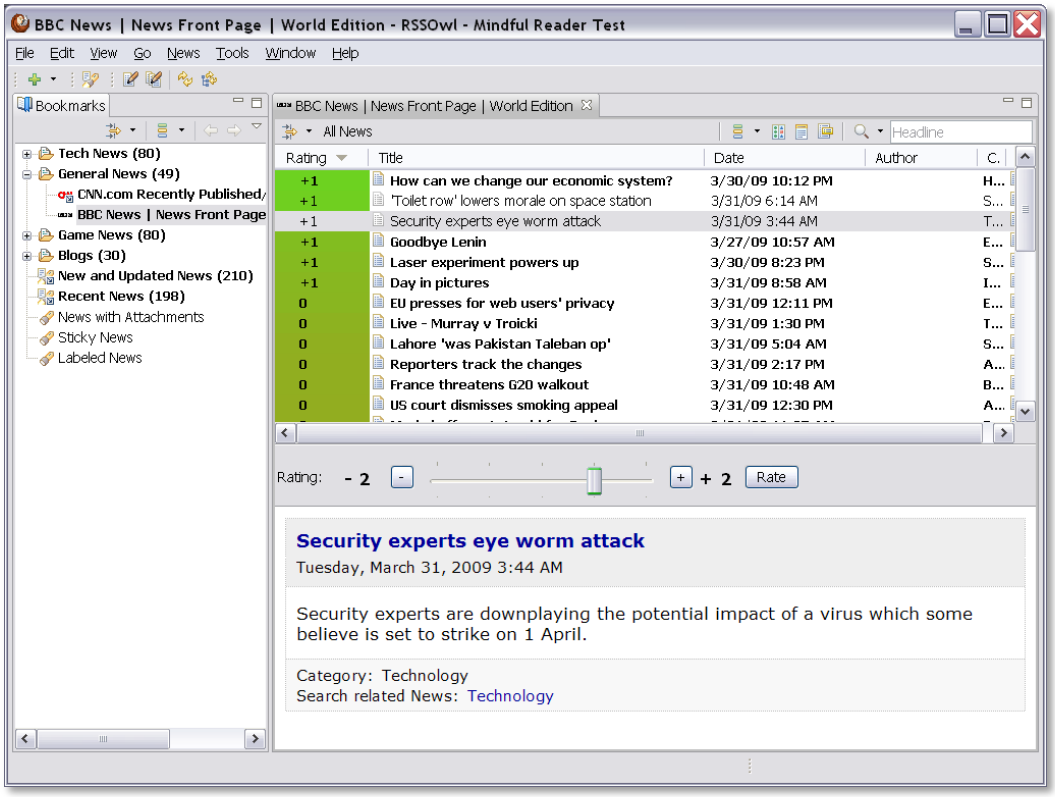


Figure 19 – Mindful Reader, Alpha Screenshot

5.5 Beta Release

The second public release of the Mindful Reader software contained a number of improvements over the alpha release, including:

- Fixed "jumping" behavior – article ratings are deferred until the user switches articles.;
- Prediction model changed to the Classifier system described in section 4.3;
- Implicit rating mechanism tuned based on results of alpha release testing;
- Feeds update on startup by default.

As with the first testing release, this release was instrumented to record experimental data.

6 Evaluation

The Mindful Reader was tested in two distinct phases. The alpha phase was dedicated to finding the correct parameters and weights for the implicit rating system, while the beta phase was dedicated to comparing the two rating-prediction algorithms. The data gathered during the alpha phase was used to tune the software released for the beta phase. During both phases, testers were encouraged to report frustrations with the user interface and any bugs that they encountered.

6.1 Alpha Phase

The first testing/evaluation phase was limited to eight participants. It was meant to gather data necessary to calibrate the implicit interest inference mechanism and expose bugs in the software.

6.1.1 Volunteer Recruitment

Volunteers were solicited from a select group of computer-knowledgeable WPI students who had some familiarity with the project. Potential volunteers were contacted through email and in person. Those who wanted to participate were provided with a link to the Mindful Reader installer. They were also given the following instructions:

- Try to use the Mindful Reader software at least once a day for five to ten minutes, so that you can read and rate several articles.
- Try to rate every article you open, even if you only skim through the article.
- At the end of the week, follow the instructions in the readme file (and in a forthcoming reminder email) to submit the gathered testing data for analysis.

6.1.2 Distribution

For this phase, the Mindful Reader software was distributed via a link sent in private emails to the volunteers. The software itself was packaged with the Nullsoft Scriptable Install System, or NSIS (http://nsis.sourceforge.net/).

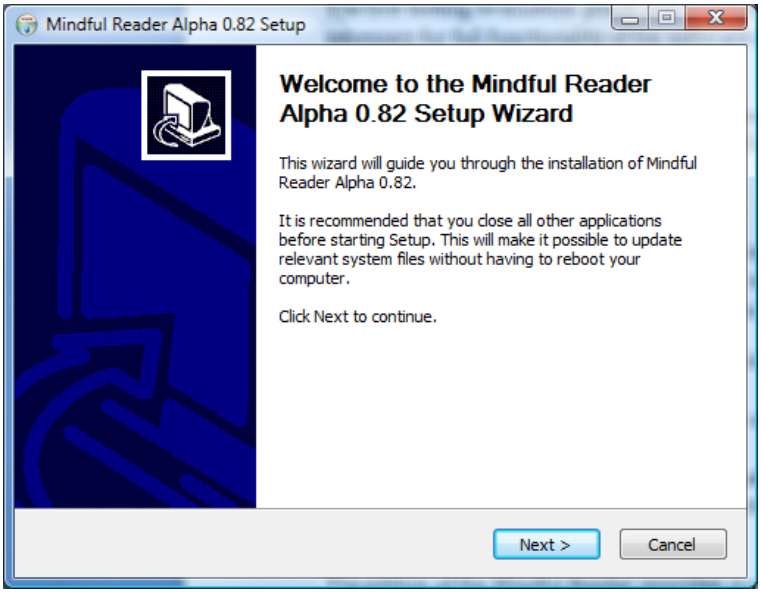


Figure 20 – Mindful Reader Installer

The use of this install system, pictured in Figure 20, provided several advantages:

- It allowed for display of the Eclipse Public License (EPL), which is the license used by the RSSOwl project.
- It allowed creation of appropriate shortcuts and folders, for easy access to the software, the project website, and the read-me file.
- It automatically created an uninstaller so that users could remove it easily following testing, or upgrade cleanly to a new version of the software.

6.1.3 Data Gathering

The edition of the Mindful Reader provided during this phase was instrumented to track data related to user interactions with articles. For each viewed article, the software recorded: the

- Predicted, implicit, and (if provided by the user) explicit rating values for the article;
- Article length in characters;
- Time that the user spent viewing article in milliseconds;
- Clickable elements within the article (i.e. "<a>" tags in the HTML);
- Number of times the user clicked within the article;
- Distance the user moved the mouse over the article in pixels;
- Width and height of the article viewing panel in pixels.

The software also recorded date stamps marking the start of each use session.

Even though the implicit rating value assigned by the software was included in the tracked data, the rest of the data included was actually sufficient to construct that implicit rating. The purpose of this testing phase was to fine-tune the weights assigned to the three interest indicators – reading speed, clicks within the article, and mouse movement over the article.

6.1.4 Testing Results

After the testing week concluded, the alpha phase testers were instructed to submit the experimental data gathered by the Mindful Reader software and complete a brief survey on their experience. Not all testers answered every question from the survey. The alpha test survey included the following questions:

1. Have you used a newsfeed (RSS, Atom, etc.) aggregator such as Google Reader, NewsGator, RSSOwl, or Thunderbird before?
    - Yes (3 out of 7 respondents)
    - No (4 out of 7 respondents)
2. On average, about how much time per day do you spend browsing news websites and/or blogs with regularly posted new content?
    - Less than 15 minutes (3 out of 7 respondents)
    - 15-30 minutes (1 out of 7 respondents)
    - 30-45 minutes (2 out of 7 respondents)
    - More than 45 minutes (1 out of 7 respondents)
3. About how many times did you use the Mindful Reader software over the past week?

- 1 to 2 times (2 out of 7 respondents)
- 3 to 4 times (5 out of 7 respondents)

4. On average, about how long did spend with the software each time you used it?
    - 1 to 5 minutes (0 out of 7 respondents)
    - 6 to 10 minutes (1 out of 7 respondents)
    - 11 to 15 minutes (4 out of 7 respondents)
    - More than 15 minutes (2 out of 7 respondents)
5. On average, about how many articles did you read per use session?
    - 1 to 3 articles (0 out of 7 respondents)
    - 4 to 6 articles (4 out of 7 respondents)
    - 7 or more articles (3 out of 7 respondents)
6. If you have used another newsfeed aggregator/reader system, how long did it take you to catch up on your feeds (i.e., read most of the articles of interest) using the Mindful Reader, relative to that other system?
    - I have not used another aggregator/reader system (5 out of 6 respondents)
    - 10 or more minutes longer than when using the other system (1 out of 6 respondents)
7. The Mindful Reader attempts to predict whether or not you will find new articles interesting, based on ratings you have made in the past; it then promotes those articles up the article list. By the end of the week of testing, about how many of the 5 top-ranking articles were interesting (ultimately rated +1 or better) to you?
    - 0 (1 out of 6 respondents)
    - 1 (2 out of 6 respondents)
    - 2 (0 out of 6 respondents)
    - 3 (2 out of 6 respondents)
    - 4 (1 out of 6 respondents)
    - 5 (0 out of 6 respondents)
8. Many testers commented on the "jumping" behavior that follows rating an article, where the article moves in position on the article list to match its new rating. Which of the following behaviors would you like to see implemented to fix that problem? (select all applicable)
    - Rated articles do not change position. (3 out of 7 respondents)
    - Rated articles change position, but only after the user selects a new article to read (so that the list does not jump). (5 out of 7 respondents)
    - Rated articles are marked with a "*" symbol to indicate that they have been rated. (3 out of 7 respondents)
    - Rating an article causes the Mindful Reader to automatically open the next-highest-rated unread article. (0 out of 7 respondents)

Testers were also asked to note any bugs or major unexpected behavior, and provide suggestions for future development of the software. None of the testers noted any problems with software stability, but some commented on initial frustrations regarding inability to re-rate articles. Two testers suggested incorporating article ages into the rating prediction mechanism or article sorting

mechanism, as they were frustrated with reading older articles made irrelevant by newer articles that were nonetheless lower-rated by the system.

The results of the survey suggested that 50% of testers derived some benefit from the article rankings, and also that the majority of testers spent an hour or more with the software over the course of the week.

Question 7 in the survey was added to poll users about their preferred solution to a problem noted by several testers during the week of testing. From the results, it was clear that the majority of users preferred that the list of articles remain sorted based on the explicit ratings to articles, but that they would not mind deferring that sorting until they opened a new article to read.

6.1.5 Data Analysis

The full set of data from the alpha test can be seen in Appendix D. The primary purpose of recording this data was to find the optimal set of weights for the three implicit interest metrics (reading speed, mouse clicks, and mouse movement). The secondary purpose was to check the correlation between predicted article ratings and explicit article ratings.

For the alpha release, the weights were set such that reading speed contributed 70% of the implicit score, mouse clicks contributed 20%, and mouse movement contributed 10%. The baseline reading speed against which measured speeds were compared was set to 1800 characters per minute. Individually, none of the three metrics correlated strongly to the explicit ratings provided by users; given a linear regression of the metrics against explicit ratings, they had the following squared correlation coefficients (R^2):

- Reading Speed (Normalized) vs. Explicit linear regression R^2: 0.1004
- Clicks (Normalized) vs. Explicit linear regression R^2: 0.0396
- Mouse Movement (Normalized) vs. Explicit linear regression R^2: 0.0617

Combining those three metrics with the initial weights yielded an R^2 of 0.1094. This was superior to any one metric taken individually, but still not a tremendously strong correlation. Since all of the information used to produce the implicit rating was recorded by the software, it was possible to recalculate the implicit ratings with different weights on the three metrics, as well as a different baseline reading speed for the reading speed metric.

The optimal weights for the metrics were derived by systematically incrementing and decrementing each weight at the expense of the other two weights, as well as incrementing and decrementing the reading speed. Through this process, it became apparent that the original baseline reading speed of 1800 characters per minute was generating too many false positives; a lower value of 1500 characters per minute yielded better correlation. Similarly, for many of the testers, mouse movement correlated strongly to engagement compared to mouse clicks. Re-balancing the weights so that reading speed contributed 50%, mouse clicks contributed 10%, and mouse movement contributed 40% to the final implicit rating yielded stronger correlation for four of six testers who provided useful information. Of the other two, one had a weak negative

correlation from the start, and one with a weak positive correlation saw a small decrease in correlation.

A few testers behaved in unexpected ways, yielding some unusual data. One tester gave only positive explicit ratings, making it impossible to check the correlation between his implicit and explicit ratings. Two other testers frequently gave low explicit ratings to articles that they appeared to read in full and interact with. It is possible that this unusual data resulted from the two testers becoming distracted by outside stimulus while using the Mindful Reader, but none of the other six testers exhibited any similar behavior.

Amongst the other testers, three in particular made extensive use of the software, and their explicit ratings correlated relatively well with the implicit ratings generated by tuning the implicit metric weights. In Figure 21, the tuned implicit ratings for these users are plotted against the explicit ratings that they made for each article, alongside a simple linear regression. The data for tester 'ma005' shows a particularly firm correlation. This user was apparently comfortable with the implicit rating mechanism, as the recorded data shows that he/she relied on the implicit mechanism to rate articles in most cases, rather than give explicit ratings for each article.

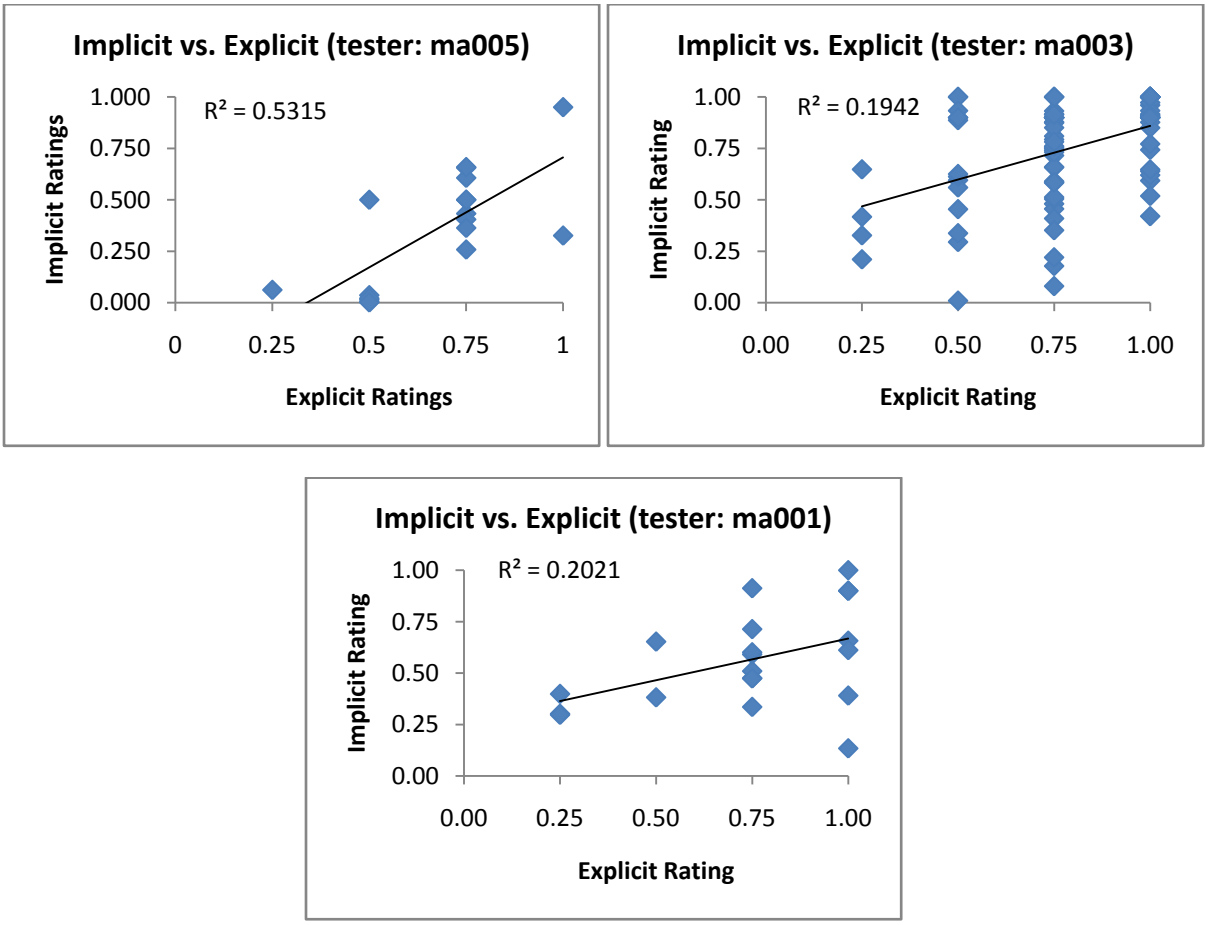


Figure 21 – Alpha Test - Implicit vs. Explicit Ratings Linear Regression (Three Users)

Of the three testers in Figure 21, 'ma001' is on the cusp of statistical significance at the α=0.05 level, while the other two pass with ease. This suggests that for many users the implicit inference mechanism is a reasonable predictor of interest.

Figure 22 shows a box-and-whiskers plot of the tuned implicit ratings for all users against the five possible explicit ratings. The weak positive correlation is visible, and it seems that the implicit rating mechanism can identify the most-interesting articles relatively accurately.

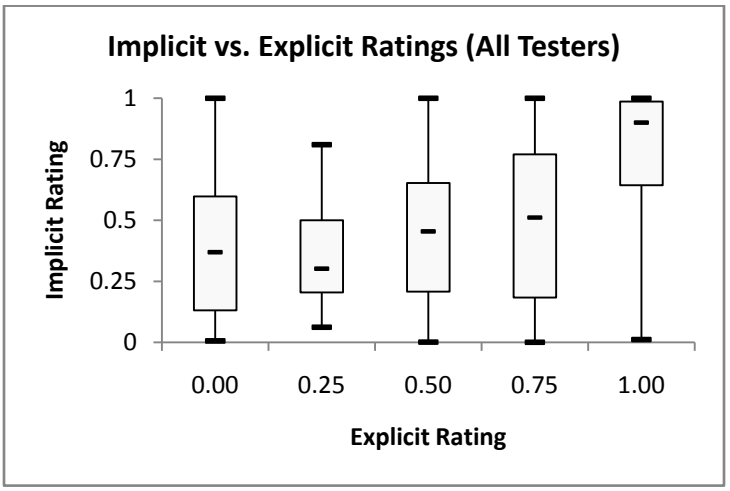


Figure 22 – Alpha Test - Implicit vs. Explicit Ratings Boxplot

While tuning the implicit metric weights improved the accuracy of the implicit rating mechanism for most users, it is apparent that different users interact with and rate articles differently. In particular, there was variation amongst the apparent reading speed for the testers; one tester consistently read articles between three and five times faster than all other testers. Other users seldom clicked anything within the articles, or moved their mice relatively little. For future versions of the Mindful Reader, it could be beneficial to pursue a self-tuning mechanism to adjust the implicit metric weights based on calculated correlation with explicit ratings.

Predicted article ratings were recorded by the Mindful Reader software, but there was only a weak correlation between these ratings and the explicit ratings that users assigned to articles. Figure 23 shows the linear regression between the predicted and explicit ratings. The regression line is nearly flat, as the prediction method did not yield a wide distribution of ratings, and the correlation appears weak, with an R^2 of only 0.0981. The correlation is statistically significant at the α=0.05 level, mainly by dint of the number of rating pairs involved (232 in all).

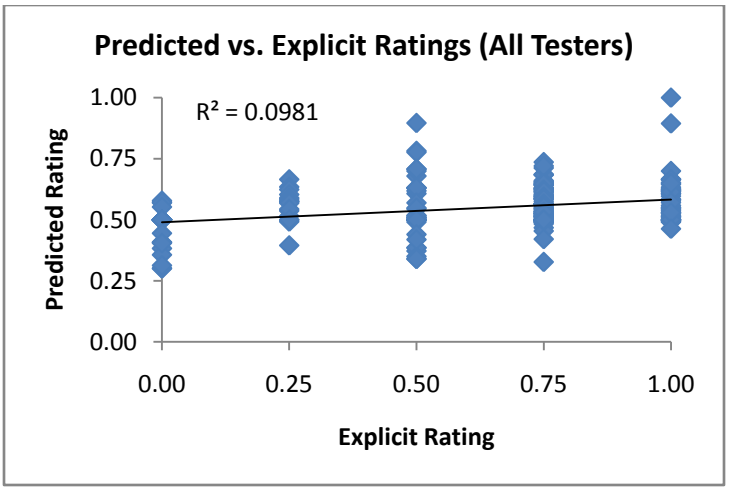


Figure 23 – Alpha Test - Predicted vs. Explicit Ratings Linear Regression

The somewhat weak correlation have occurred in part because the alpha build made exclusive use of the Weighted Average prediction model, which failed to take some factors (such as global term frequencies) into account. Another possibility is that users were making use of the explicit rating mechanism to correct the system when it gave inaccurate predictions about articles. In this case, the explicit ratings would seldom align with the predicted ratings, yielding the poor correlation seen in the alpha test data.

Lastly, the alpha test only lasted for one week, and most users did not spend extensive lengths of time with the software. It may take more time and user training to build a reliable user interest model; most users are interested in a wide variety of topics that do not necessarily appear on a daily basis. For instance, a user might be interested in news regarding a particular upcoming movie, game, or book. Assuming that the user is not subscribed to a feed devoted to that particular topic, it might take days or weeks for a mention of the topic (possibly in the form of a preview or review) to arrive.

It was not possible to extrapolate further on the prediction accuracy issue, unfortunately, because the alpha build did not record any information about the articles that the testers did *not* read. Given the ratings of unread articles, it would be possible to see if the user was ignoring low-rated articles in favor of high-rated articles. A distribution of unread articles trending towards low-rated articles would imply that the prediction model was correctly promoting interesting material. Similarly, a flat distribution or a distribution trending towards high-rated articles could imply serious flaws in the prediction model. This is examined in the beta phase.

6.2 Beta Phase

The second testing/evaluation phase involved twenty participants. It was a beta test, meant to test the effectiveness of the user interest model prediction algorithm in the real world. Unlike the alpha test, this test involved two groups: one group using the full Mindful Reader software, and the other group acting as a control by using a version of the Mindful Reader software stripped of new user interface elements, including predicted article ratings.

6.2.1 Volunteer Recruitment

Unlike the alpha test, the tester volunteers for the beta test were solicited via an email request sent to all WPI undergraduate students majoring in either Computer Science or Interactive Media and Game Development. Several of the testers from the alpha test volunteered again for the beta test, and some of the new volunteers suggested further potential volunteers to contact.

The request email was sent twice over the course of two days. Because some volunteers responded to the second request, or simply responded late to the first test not all of them started testing the software simultaneously.

6.2.2 Distribution

As with the alpha test, the software for the beta test was distributed in the form of a stand-alone installer created with the Nullsoft Scriptable Install System. Testers were once again emailed with instructions and a link to the installer. Because there were two groups of testers, however, there were also two different installers. One installer installed the regular edition of the software, while the other, marked by a "c" in its version number, installed the stripped-down control group edition of the software.

6.2.3 Data Gathering

The beta build of the Mindful Reader software was instrumented to gather additional data beyond the data recorded by the alpha build. Specifically, it recorded three new things:

- Session beginning time for each session;
- Article rating predictions based on both the Naïve Bayes Classifier model and the Weighted Average model (as described in section 4.4) for each rating event;
- Distributions of unread articles across rating classes for each session, for ratings based on both the Naïve Bayes Classifier model and the Weighted Average model.

All three of these new elements provided data for evaluating the performance of the user interest model and the efficiency gain (or loss) between a normal user interface and the Mindful Reader interface. With the session beginning and ending times, it was possible to calculate the length of each session with the software. This value was used to compare the average session length between the control group and the test group.

Recording the predicted ratings provided by both the classifier model and the weighted average model allowed for comparison between the two models, as well as the possibility of combining the two values to produce a hybrid predicted rating. Finally, the two unread article distributions could be used to see if the user was in fact ignoring lower-rated articles in favor of higher-rated articles.

6.2.4 Testing Results

As with the alpha test, the volunteer testers from the beta test were given a survey to fill out. Only nine of the twenty testers elected to take the survey, and only eight completed it, but they did provided some insight into their use of the software. The full set of responses can be seen in Appendix F.

Seven of eight respondents said that they found the Mindful Reader prediction mechanism to be at least "somewhat accurate," yet only four of eight respondents treated the predicted ratings as an influential factor in their decision to read a given article. Testers were instead focused on article titles and sources as major influences in their reading choices.

Some testers derived little use from the Mindful Reader enhancements because they were interested in almost all articles from their chosen feeds; one commented that the project "would be more useful if I didn't read every post anyway." Another commented that it might be best to allow certain feeds to override the prediction mechanism, as there are some feeds, such as webcomic feeds, that provide little to no textual content.

Some users also noted frustration with navigating the user interface to read their feeds. Of these, two users complained about a lack of similarity to the popular Google Reader online service. One requested keyboard shortcuts for quickly switching between articles, while another requested the ability to rate articles without clicking away from and losing focus on the article listing.

Finally, one tester expressed frustration with the implicit rating mechanism, saying that he or she disliked when the software "automatically [made] something -1 because you clicked it and didn't read it." It is unfortunately difficult for the software to determine whether the user skipped an article because he or she was not interested in it or because he or she clicked it early by mistake. In the former case, the present behavior is desired, but in the latter case, the user may have some interest in the article that will wind up ignored.

It might be valuable to make the implicit rating mechanism somewhat more transparent to the user. It might also be valuable to add a "save for later" button, in the event that the user clicked on the item accidentally and might still be interested in reading the article at a later time.

6.2.5 Data Analysis

The data from the beta test, visible in its entirety in Appendix G, showed two interesting time-related trends. First, as with the alpha test, there was some correlation between implicit and explicit content ratings provided by the user and the predicted ratings generated by the system. This correlation was very weak when viewing data for all sessions simultaneously, as can be seen in the two graphs in Figure 24.

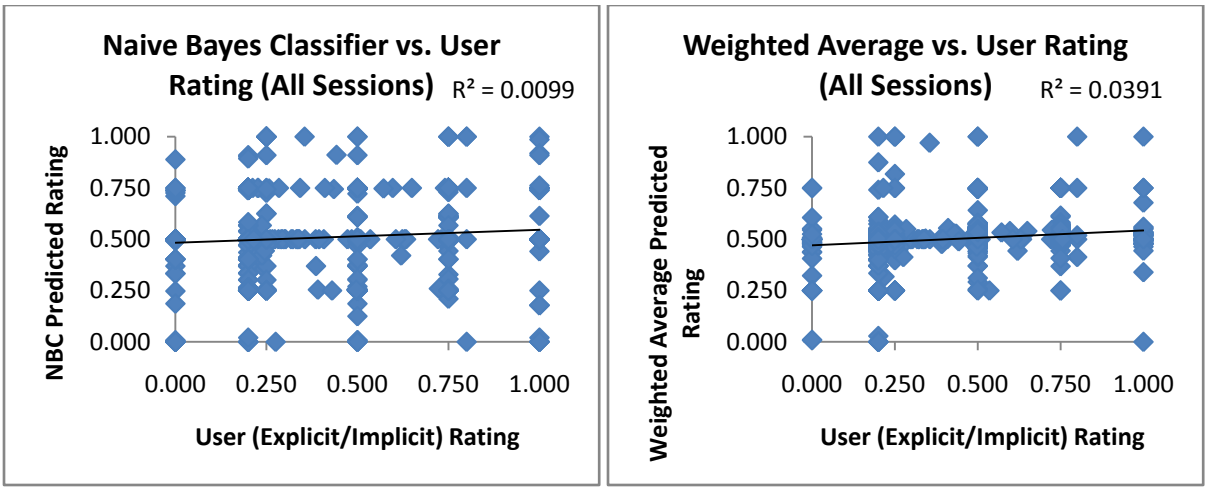
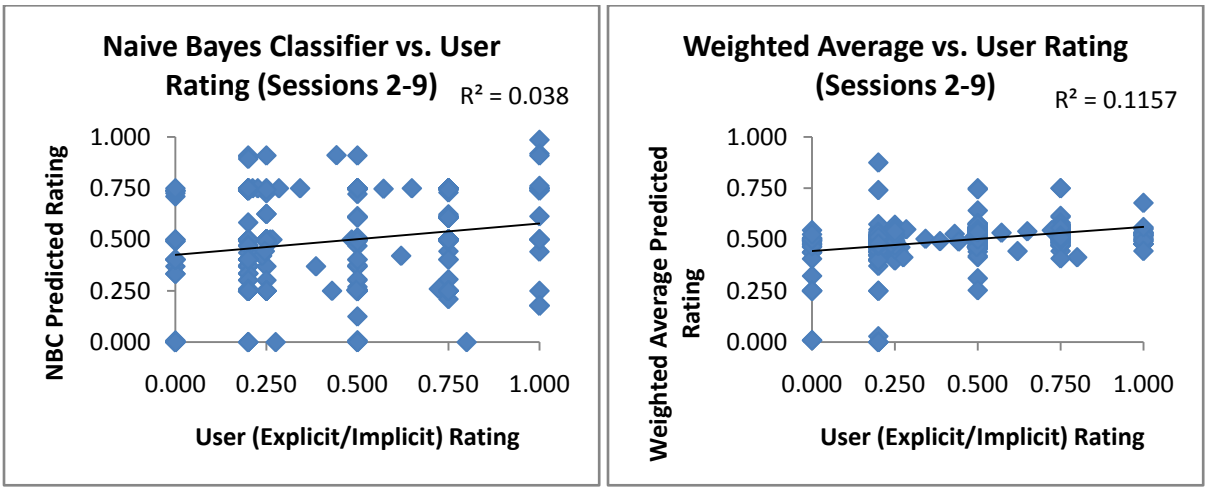


Figure 24 – Predicted Rating vs User Rating – All Sessions

The correlation becomes progressively stronger as early testing sessions are eliminated from consideration. It should be noted that eliminating the early testing sessions eliminates all data from some testers, as not all testers remembered to use the software several times. Still, Figure 25 shows how the correlation grows stronger for both prediction mechanisms as the first and second testing sessions are removed from consideration.



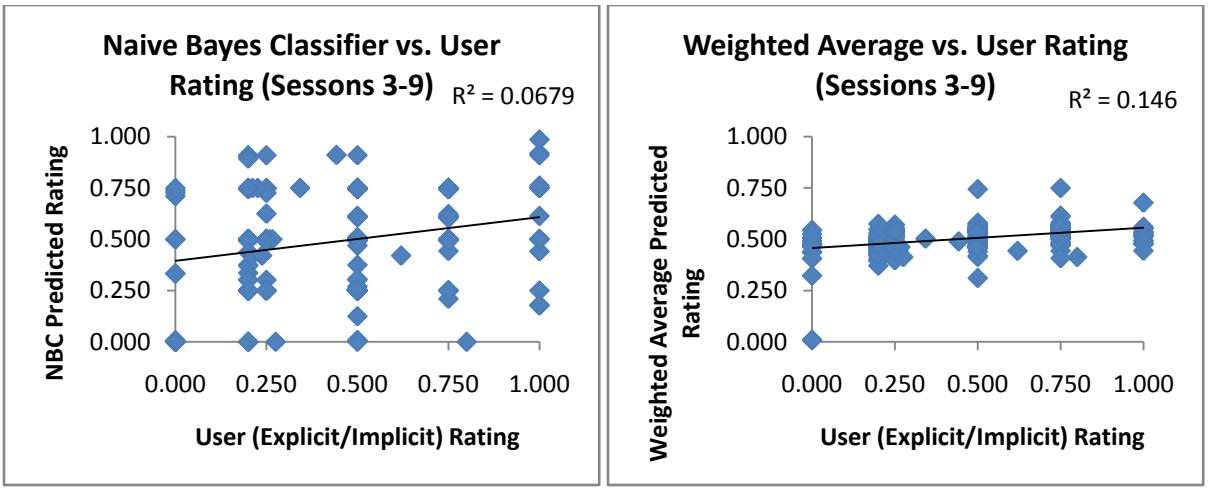


Figure 25 – Predicted Rating vs. User Rating – Early Sessions Removed

This increase in correlation is consistent with the expectation that the user interest model should grow and become more accurate with time. Unfortunately, of the twenty testers, only five used the software for three or more sessions, so it is difficult to draw conclusions about the continuation of this trend. The user rating to predicting correlation achieved statistical significance at the $\alpha=0.05$ level for the Weighted Average predictions from the second session onward. The Naïve Bayes Classifier correlation was more tenuous, but it was statistically significant for data from the third session onward.

It is also interesting to note that from this data alone, the weighted average prediction mechanism seems to be more accurate than the Naïve Bayes Classifier prediction mechanism, despite its comparative simplicity. This may in part be a mathematical artifact from the way the weighted average predictions are compressed close to the neutral value (0.5, or class 0). It may also imply that the Naïve Bayes Classifier prediction mechanism requires a more comprehensive user interest model built over a longer period of time.

The second major time-based trend visible from the data was a tendency for testers to increasingly favor high-rated articles over low-rated articles as time went on. This trend was only visible from the Naïve Bayes Classifier predictions, as the software only recorded which class unread articles fell into. As all of the weighted average predictions were compressed around the neutral value, almost all unread articles fell into class 0. The classifier-based predictions did not have this problem.

The dashed blue line on the charts of Figure 26 represents the average Naïve Bayes Classifier-based predicted rating for articles that testers opted to read, while the solid red line represents the average predicted rating for articles that testers ignored. Early on, these two averages are close together, because both prediction mechanisms default to a neutral score when the user interest model lacks information on the terms found in an article.

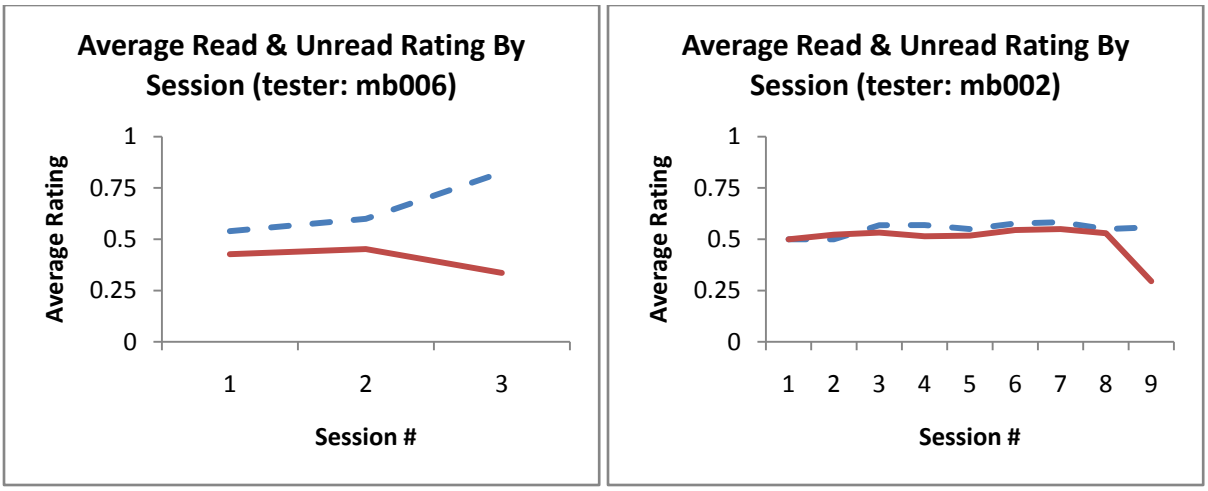


Figure 26 – Average Read/Unread Article Rating by Session (2 Testers)

This trend suggests that the testers tended to agree with the predicted ratings, and the survey results back up this interpretation, as seven out of eight respondents said that they found the prediction mechanism to be somewhat accurate.

As with the alpha test software, the beta test software recorded implicit ratings and the data used to generate those ratings. Figure 27 shows linear regressions of two testers' implicit ratings against their explicit ratings. Once again, most testers showed statistically significant positive correlation between their implicit and explicit ratings. Two of the testers yielded a negative correlation, however, suggesting again the need for the software to adapt its inference mechanism to individual users' behaviors.

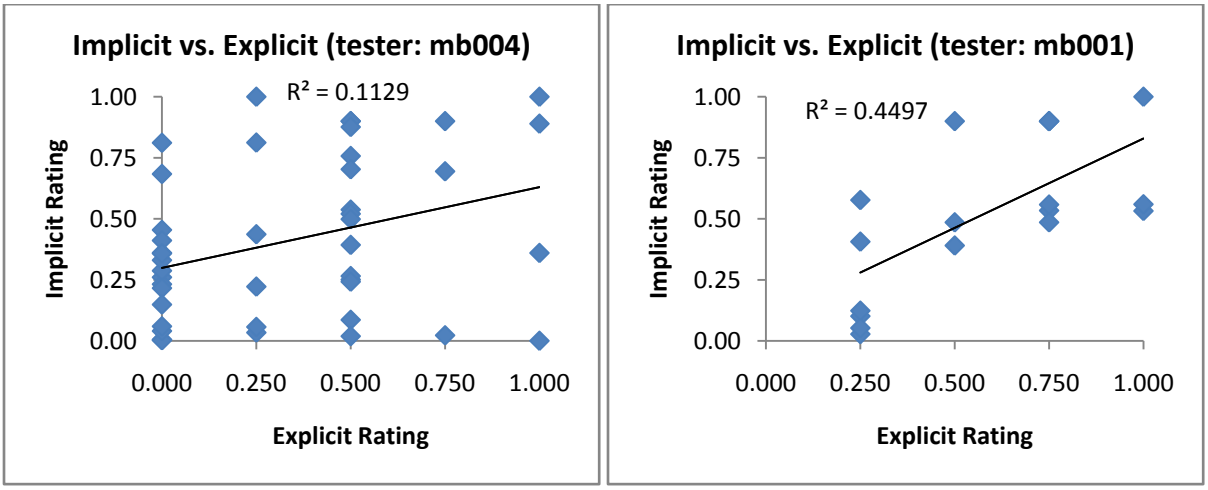


Figure 27 - Beta Test - Implicit vs. Explicit Ratings Linear Regression (Two Users)

Only two of the three control group testers (who were provided with a standard-interface RSS reader) returned usable data; the third control group tester loaded the software with a set of feeds that caused the rating mechanism to malfunction, since the articles apparently lacked titles, descriptions, and author names. Furthermore, the control version of the software relied exclusively

on implicit ratings, which may not always accurately reflect a user's interest in a given article. Given this limitation, the user interest models developed by the control software were most likely incomplete.

With those caveats in mind, the data from the two reporting control group members appears similar to the data from the normal testing group, in that the correlation between predicted ratings and user ratings grows stronger from session to session. For the control group, the user ratings are simply the implicit ratings, since control testers had no way to make explicit ratings. Because the interface was unmodified, the testers could not see or react to the ratings. Figure 28 shows a linear regression over all sessions for both methods.

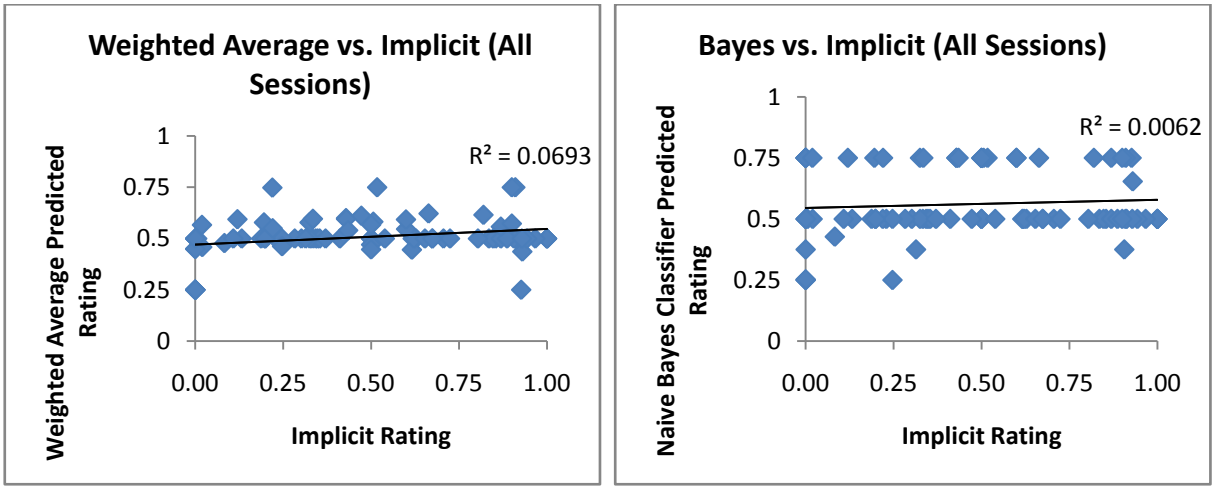


Figure 28 – Predicted Rating vs. Implicit Rating (Control Group, All Sessions)

Figure 29 and Figure 30 show how the correlation increases when data from earlier sessions is removed.

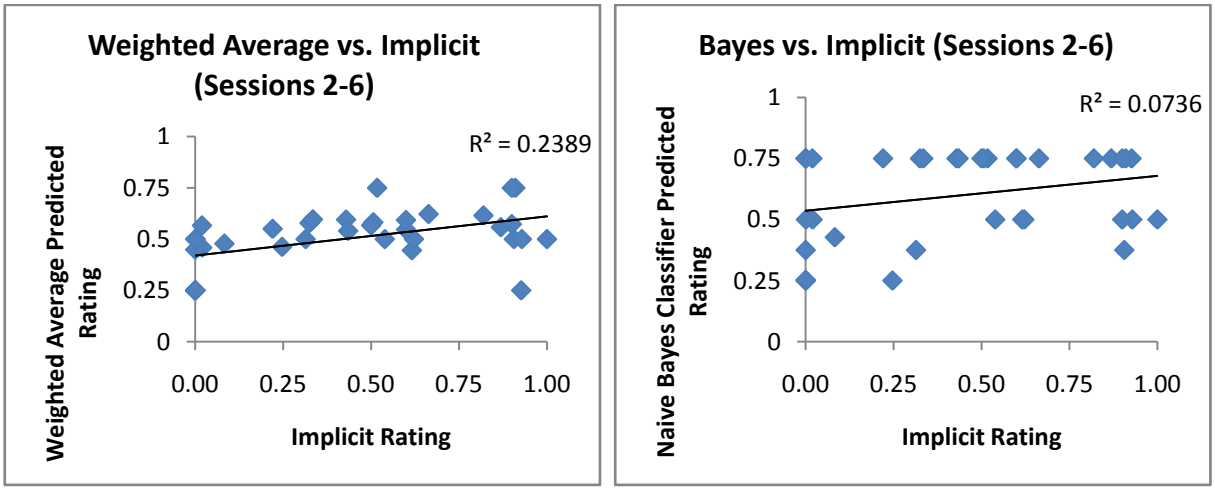


Figure 29 – Predicted Rating vs. Implicit Rating (Control Group, Sessions 2-6)

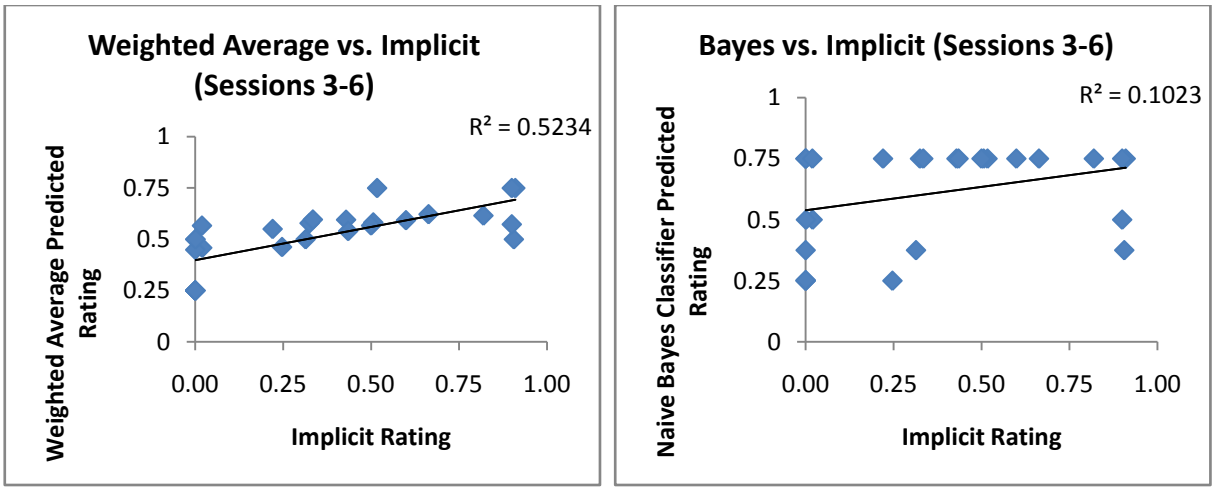


Figure 30 – Predicted Rating vs. Implicit Rating (Control Group, Sessions 3-6)

The Naïve Bayes Classifier prediction model did not quite achieve statistical significance at the α=0.05 level, though the Weighted Average model managed it with ease. This suggests two things: first, that the user interest model can improve from implicit ratings alone, and second, that the results recorded from the normal testing group may not be simply the result of a psychological effect from seeing the predicted ratings assigned to articles.

The second trend from the standard test group, wherein the average predicted rating for read articles became higher than the average predicted rating for unread articles with time, was not evident amongst the control group. Figure 31 shows the plots of these averages over time for both control group testers. As before, the dashed blue line represents the average predicted rating for read articles, while the solid red line represents the average predicted rating for unread articles.

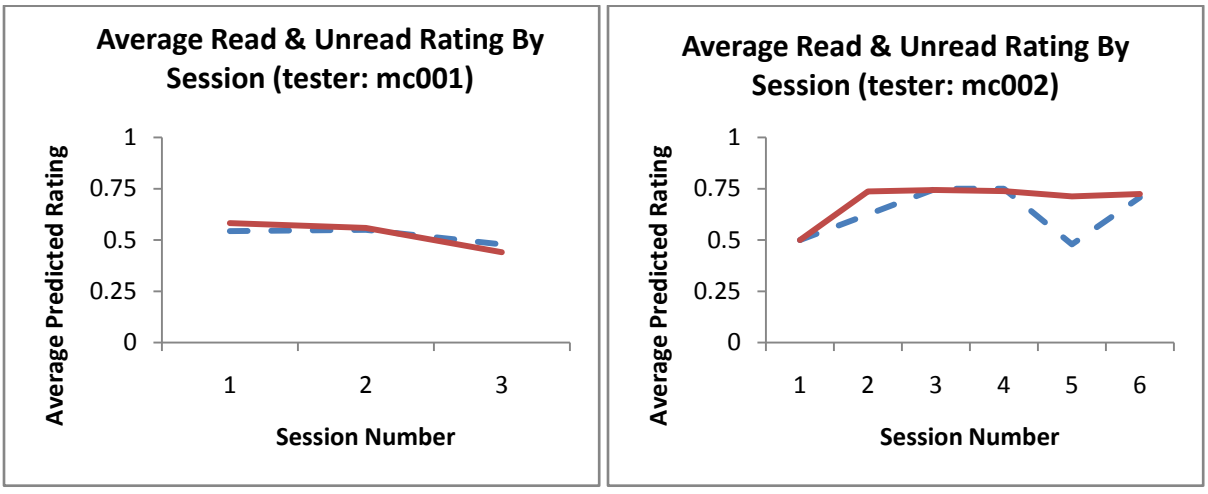


Figure 31 - Average Read/Unread Article Rating by Session (Control Group)

It is possible that the trend is not evident because the control group testers read relatively few articles per session. As a result, the average predicted rating for read articles varied greatly from session to session, particularly for tester mc002.

7 Conclusion

The primary goal of the Mindful Reader project from a user standpoint was to reduce the time necessary for a given user to locate and read newsfeed articles of particular interest, thereby reducing the average time required to use the aggregator software for users not interested in reading all available articles. To accomplish this goal, an open-source newsfeed aggregator known as RSSOwl was augmented with machine-learning techniques. The augmented software, known as the Mindful Reader software, built a user interest model from implicit and explicit article ratings, and then applied that model to new articles to predict their ratings.

7.1 Project Evaluation

Once the Mindful Reader software was developed, it was distributed to volunteer testers for two separate week-long tests: an alpha test, focused on gathering data to tune the implicit inference mechanism, and a beta test, focused on gathering data about the accuracy of the prediction model. Most of the testers of the final version of the software said that it took them slightly longer than average to use the Mindful Reader software. Several commented that this was due to interface differences between the Mindful Reader and their preferred aggregator software/service (typically Google Reader). Additionally, while most testers found the prediction mechanism to be somewhat accurate, few considered the article rating predictions to be a major influence in their choice of which articles to read.

The two tests were too brief to be truly conclusive. Longer tests would have allowed further development of the user interest models, and clarified whether or not some of the perceived trends over time were truly significant. Still, the data from alpha test suggests that the software can infer user interest in a given article with a limited degree of accuracy. The data from the beta test suggests that the accuracy of the user interest model's predictions regarding article ratings improves as users spend successive sessions reading and rating articles with the software.

7.2 Future Possibilities

Before the Mindful Reader software is extended in any way, it needs more testing. The most interesting trends discussed in section 6.2.5 were only apparent amongst the testers who used the software extensively (including the testers who were returning from the alpha test for a second week of testing). Ideally, the software should be tested for a minimum of a month with a variety of users to gain a more complete view of the growth and development of the user interest model.

For future development, the interface could be modified to support the shortcuts demanded by advanced users with relative ease. Additionally, the implicit interest inference mechanism could be updated to self-tune based on typical observed user characteristics such as reading speed and amount and pattern of interaction with articles; it was clear from both the alpha and beta test data that different users read and interacted with articles in very different ways. Finally, it might be possible to improve the prediction mechanism by taking certain additional factors into account, including article age and similarity to recently read articles.

Newsfeed aggregation will likely prove important to the continued development of personal information agents, as feeds provide a standardized, machine-readable summary of the current

contents of web sites and blogs. In that sense, the Mindful Reader project is a first step towards a more comprehensive personal information agent. The next major step in the process will be to build a unified user interest model from similar personalized streams of information, such as social networking updates, instant messages, and emails. With such a unified model, it should be possible to serve users all of their important, interesting content through a single streamlined interface.

7.3 Project Experience

This project was a tremendous and positive learning experience for me, as a student, researcher, and software engineer. I started the project with a number of ideas for refining the newsfeed aggregator user experience, but I was basing these ideas largely off of intuition and personal experience. Professor Brown agreed to be my advisor, and his help was invaluable; he pointed me towards an abundance of important and relevant research and background material that I would not have found by myself, including the *Curious Browser* projects and the Billsus and Pazzani papers that eventually formed the basis for the Mindful Reader software.

Some of my initial assumptions were optimistic. I believed that I would be able to develop the aggregator software from the ground up, but after some analysis of my options (prompted by Professor Brown, of course), I determined that I would more likely succeed if I based my development on an existing platform. After experimenting with a few possibilities, I settled on the open source RSSOwl project. This choice worked well for me. It is unlikely that I could have implemented aggregator functionality properly alongside the user interest model and the implicit interest inference mechanism.

RSSOwl was the first open source project I'd ever worked on at the code level. I was pleasantly surprised to find how well organized and commented it was; it compared favorably to some commercial code on which I had previously worked. Two of the project's major contributors, Benjamin Pasero and Ismael Juma, helped me learn about the software's inner workings. I hope to be able to contribute some of my changes back to the project proper once they have achieved maturity.

While I had some previous experience with testing and evaluating software, primarily from my Interactive Media and Game Development MQP (Design and Development of a Multiplayer Survival-Horror Game), I was relatively inexperienced with managing an ongoing test and gathering experimental data. The two-phase test structure, suggested by Professor Brown, helped immensely. I gathered useful data during the alpha test that helped me tune the software, but I also learned about the testing process itself. I recognized and corrected some flaws in my data gathering methods, learned to keep frequent contact with my testers, and streamlined my data entry and analysis process.

My major regret in this project is not building a full project team to work with. I had additional ideas for the project that could have been implemented with a helping hand. With a second programmer to help I could have taken advantage of code reviews and other Agile development techniques to produce cleaner and better-functioning code. With the help of Professor Brown and Mr. Pasero I was far from alone on the project, though, and I am very happy with the final results.

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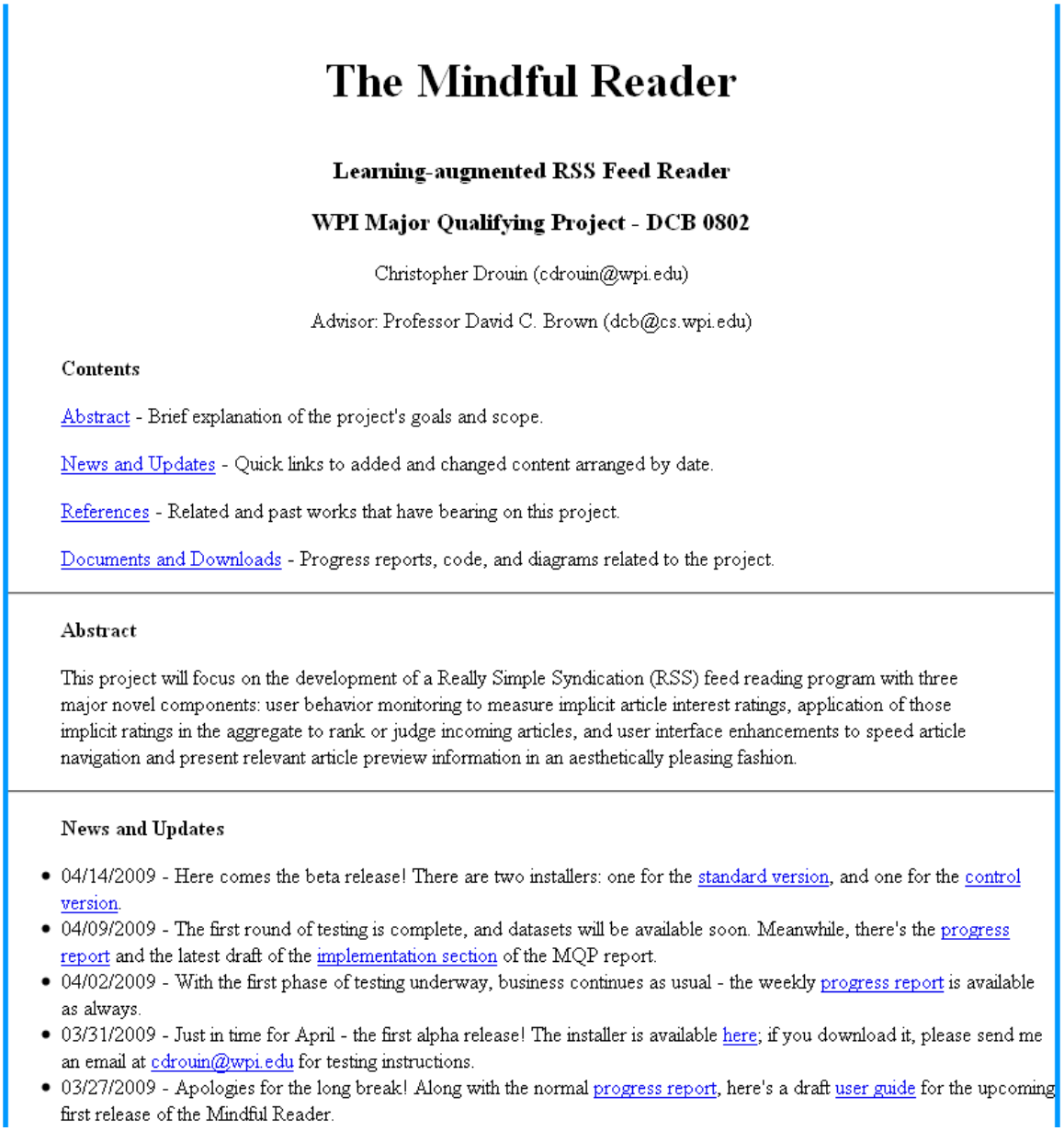
Appendix A – Website Design

This project revolved around its website for purposes of communication, instruction, and content distribution. The website is located at http://users.wpi.edu/~cdrouin/rssreader/ ; it was created with Adobe DreamWeaver. The website is divided into three primary sections:

- the index, which lists news and links to the other two sections;
- the downloads page, which provides links and descriptions for report materials, software, code, and progress reports;
- the references page, which provides citations and direct links to project references.



The Mindful Reader

Learning-augmented RSS Feed Reader

WPI Major Qualifying Project - DCB 0802

Christopher Drouin (cdrouin@wpi.edu)

Advisor: Professor David C. Brown (dcb@cs.wpi.edu)

Contents

Abstract

This project will focus on the development of a Really Simple Syndication (RSS) feed reading program with three major novel components: user behavior monitoring to measure implicit article interest ratings, application of those implicit ratings in the aggregate to rank or judge incoming articles, and user interface enhancements to speed article navigation and present relevant article preview information in an aesthetically pleasing fashion.

News and Updates

- 04/14/2009 - Here comes the beta release! There are two installers: one for the standard version, and one for the control version.
- 04/09/2009 - The first round of testing is complete, and datasets will be available soon. Meanwhile, there's the progress report and the latest draft of the implementation section of the MQP report.
- 04/02/2009 - With the first phase of testing underway, business continues as usual - the weekly progress report is available as always.
- 03/31/2009 - Just in time for April - the first alpha release! The installer is available here; if you download it, please send me an email at cdrouin@wpi.edu for testing instructions.
- 03/27/2009 - Apologies for the long break! Along with the normal progress report, here's a draft user guide for the upcoming first release of the Mindful Reader.

Website Index

Appendix B – Correspondences with RSSOwl Team

Benjamin Pasero is the project administrator for the RSSOwl open source newsfeed aggregator project. Mr. Pasero and Ismael Juma (one of the other major contributors to the project) aided the Mindful Reader project by explaining the project architecture and answering questions about its functionality.

November 11, 2008 – "Starting an experimental RSS reader project"

> Mr. Pasero,
>
> Hello; I'm Chris Drouin, a student at Worcester Polytechnic Institute. I am a senior, finishing up my degree in Computer Science. For my capstone project here at WPI I am setting out to develop a small experimental newsfeed aggregator client. The client will use machine learning techniques to highlight interesting incoming articles for the user, inferring preferences and interests from the user's past behavior while reading similar articles. I am also interested in developing some UI improvements – content preview functionality that lets users visually identify articles at a glance, and possibly a new feed/article navigation system.
>
> I am still in the design phase of the project, working out the requirements and a schedule for development. In particular, I am looking for research that might have bearing on the project; in the realms of user-preference inference, there's a fair bit of work out there (particularly in the form of the Curious Browser projects carried out here at WPI several years ago). I have found comparatively little research relating to the subject of newsfeeds and aggregators specifically – there is an interesting article on the technology's penetration (or lack thereof) into the mainstream here (http://publisher.yahoo.com/rss/RSS_whitePaper1004.pdf), but I have found little else online or in the article databases available through WPI. Do you know of any research that would be relevant to the development of an aggregator?
>
> At the moment, I am still undecided as to the platform I would like to develop this project on. RSSOwl itself might work well, though I believe some of the necessary elements (word frequency/value database, user behavior monitoring) might require changes at a lower level than the extensions system would permit. I will be exploring my options through the next week or so. I recognize that I've got limited time to devote to this project, so in many regards it makes more sense to start from an existing codebase. Do you think that RSSOwl would be adaptable to my aims? Further, have you run into any aggregator-specific development pitfalls that I ought to be wary of going into this project?
>
> Thanks for your time and thought here. I've been using RSSOwl for over a year now, and I'd like to be able to contribute to the project in some way (directly or indirectly). Hope to hear from you soon!
>
> Sincerely,

~~Chris Drouin

November 13, 2008 – "Re: Starting an experimental RSS reader project"

```
Hi Chris,
>
> Hello; I'm Chris Drouin, a student at Worcester Polytechnic Institute.
> I am a senior, finishing up my degree in Computer Science. For my
> capstone project here at WPI I am setting out to develop a small
> experimental newsfeed aggregator client. The client will use machine
> learning techniques to highlight interesting incoming articles for the
> user, inferring preferences and interests from the user's past
> behavior while reading similar articles. I am also interested in
> developing some UI improvements – content preview functionality that
> lets users visually identify articles at a glance, and possibly a new
> feed/article navigation system.
>
Cool! my master thesis was going into information retrieval as well!
>
> I am still in the design phase of the project, working out the
> requirements and a schedule for development. In particular, I am
> looking for research that might have bearing on the project; in the
> realms of user-preference inference, there's a fair bit of work out
> there (particularly in the form of the Curious Browser projects
> carried out here at WPI several years ago). I have found comparatively
> little research relating to the subject of newsfeeds and aggregators
> specifically – there is an interesting article on the technology's
> penetration (or lack thereof) into the mainstream here
> (http://publisher.yahoo.com/rss/RSS_whitePaper1004.pdf), but I have
> found little else online or in the article databases available through
> WPI. Do you know of any research that would be relevant to the
> development of an aggregator?
>
No, I am not ware of the use of information retrieval in aggregators, at
least not client side. Obviously there is tons of side that take a list of
feeds and try to show you the most interesting entries for you. This is
called "meme" I think. Check out techmeme, feed-hub or pressflip as an
example.
>
> At the moment, I am still undecided as to the platform I would like to
> develop this project on. RSSOwl itself might work well, though I
> believe some of the necessary elements (word frequency/value database,
> user behavior monitoring) might require changes at a lower level than
> the extensions system would permit. I will be exploring my options
> through the next week or so. I recognize that I've got limited time to
> devote to this project, so in many regards it makes more sense to
> start from an existing codebase. Do you think that RSSOwl would be
> adaptable to my aims? Further, have you run into any
> aggregator-specific development pitfalls that I ought to be wary of
> going into this project?
>
```

At least RSSOwl is fulltext indexing with Lucene, so accessing the word frequencies should be possible. I agree that you might need some low level hacks to get user monitoring into the system. On the other hand, finding out about the user selecting an article in RSSOwl is something that is accessible via Events. The advantage of RSSOwl using Eclipse RCP is its loose coupling of components. You can add your stuff into the application easily without touching it. Not sure if you have any experiences with Eclipse and its module system Equinox which is highly extensible.

Aggregator specific pitfalls? I guess quite some, but hard to tell you about a specific one. Also, I wrote the parser on my own, I guess I could have avoided some pitfalls by using an existing feed parser. E.g. encoding handling, date parsing, xml parsing etc.

> Thanks for your time and thought here. I've been using RSSOwl for over
> a year now, and I'd like to be able to contribute to the project in
> some way (directly or indirectly). Hope to hear from you soon!

Happy to hear from you again.

Regards,
Ben

January 26, 2009 – "New RSSOwl-based project - pulling News descriptions as they arrive"

Hello, all. I'm Chris Drouin, a college student working on a modification of RSSOwl. My project looks to allow RSSOwl to model user interests (based on explicit and implicit feedback on articles) and highlight/promote articles relevant to those interests. If it works well, I'll try to contribute the results back to the RSSOwl project proper, at least if there's any interest in that.

For this to work in a useful fashion, I'm going to need to analyze news article descriptions and other info more or less as soon as they arrive and get interpreted. ijuma over on #rssowl suggested tracking the news as it is saved, since that would avoid processing redundant articles that have already been seen, but as best as I can tell the News objects only get saved when viewed or navigated away from. I may not be looking in the right place - does NewsDAOImpl handle article saving, as it seems?

If this is how it works, there should be something in there that marks loaded News for saving, and that's the point at which I'd like to fire an event and analyze the News. Where does that particular bit of magic happen? (Or am I going about this the wrong way?)

Thanks for any help you can provide!

~~Chris Drouin

January 28, 2009

Hi,

Bagels <hyouko.kun@...> writes:
> For this to work in a useful fashion, I'm going to need to analyze
> news article descriptions and other info more or less as soon as they
> arrive and get interpreted. ijuma over on #rssowl suggested tracking
> the news as it is saved, since that would avoid processing redundant
> articles that have already been seen, but as best as I can tell the
> News objects only get saved when viewed or navigated away from.

As I said then, add a news listener and you should be fine. It's also very simple to track when you get an event by just printing something whenever your listener is called. Trying to track where things happen before trying the obvious and suggested solution will just make it harder for you. :)

If you have issues then, please ask. Also, IRC is usually better for this sort of thing.

Best,
Ismael

January 30, 2009

Heh, thanks. After getting out of the mindset that I needed to add a listener for every News, I got something that works great.

One slightly worrisome thing: I wasn't able to import my custom listener without getting warnings and a nasty crash...

When I extended the base NewsAdapter within Controller.java, everything worked fine. The restrictions seem to come into play when working with objects from rssowl.core that aren't abstracted to interfaces. I assume I shouldn't be changing or suppressing those restrictions, but I am curious as to why they are there; is it just to enforce a level of implementation independence between the modules?

~~Chris

January 30, 2009

> ...ack, sorry, hit send by mistake; stupid iPod keypad. And it looks
> like 'inline' isn't the right word for what I meant - anyhow, when I
> extended the base NewsAdapter within Controller.java, everything
> worked fine. The restrictions seem to come into play when working
> with objects from rssowl.core that aren't abstracted to interfaces. I
> assume I shouldn't be changing or suppressing those restrictions, but
> I am curious as to why they are there; is it just to enforce a level
> of implementation independence between the modules?

Yes, that's the reason. We'd be interested to know what functionality
you require that was not available through the interfaces.

> On Fri, Jan 30, 2009 at 8:46 AM, Chris Drouin <hyouko.kun@gmail.com> wrote:
> > Heh, thanks. After getting out of the mindset that I needed to add a
> > listener for every News, I got something that works great.

Great.

> > One slightly worrisome thing: I wasn't able to import my custom listener
> > without getting warnings and a nasty crash

That's weird, can you please provide steps to reproduce this?

February 3, 2009

Hey - got the listener working beautifully last week, actually; sorry
for the delay in responding about it. Thanks for your help, though!
I'm now moving on to the slightly trickier problem of storing a new
complex object in the db4o database. The object in question is a
singleton informative-terms set; the terms are accessed through a
hash-map, and they are themselves complex objects (since they contain
data about frequency history).

I want to save this terms set out to the database only at the close of
a given session. Is there any clean-up/shutdown code where I could
safely do this? Similarly, for loading the terms back in at startup,
where would I want to do that? Finally, will I need to set up a DAO
class, adapter, and events for this terms list? (I'm explicitly
looking to avoid saving it out with every object update, since I will
eventually need to revise almost all of the terms at shutdown anyhow).

~~Chris

February 19, 2009

Sorry for the late reply.

> Bagels wrote:
> Hey - got the listener working beautifully last week, actually; sorry
> for the delay in responding about it. Thanks for your help, though!
>
> Cool!
>
> I'm now moving on to the slightly trickier problem of storing a new
> complex object in the db4o database. The object in question is a
> singleton informative-terms set; the terms are accessed through a
> hash-map, and they are themselves complex objects (since they contain
> data about frequency history).
>
> I want to save this terms set out to the database only at the close of
> a given session. Is there any clean-up/shutdown code where I could
> safely do this? Similarly, for loading the terms back in at startup,
> where would I want to do that?
> You could use the lifecycle of your plug-in for this. The Activator class
> has a start() and stop() method. Although, be carefull to do very long
> running ops from these methods, thats not allowed according to the Javadoc.
> You can also add a IWorkbenchListener to the workbench to be notified
> when it shuts down.
>
> Finally, will I need to set up a DAO
> class, adapter, and events for this terms list? (I'm explicitly
> looking to avoid saving it out with every object update, since I will
> eventually need to revise almost all of the terms at shutdown anyhow).
>
> CC'ing Ismael to comment on the DAO stuff, if thats possible at all from
> outside RSSOwl code.
>
> Cheers,
> Ben

February 21, 2009

> I'm actually working from the RSSOwl codebase proper, in part because this project requires some fairly big additions to the interface. For the moment I'm writing my additional persistent data out to file as text (which has been helpful in debugging). That said, I've made some small extensions to the News class to keep track of implicit and explicit rating values as floats, and I'm having trouble working out how to save and load them. I've roughly followed the methods I can see used to store the description, but I'm not sure how to make it load back in when the software starts up.

Also noted a possible problem - when feeds are first imported from an OPML file or newly added in, their News doesn't seem to be added to the database in the same way, as it's not triggering the listener I've set. Any news that comes along later is noticed just fine, though. Why might this be happening?

Thanks again for your support!

~~Chris Drouin

February 21, 2009

> I'm actually working from the RSSOwl codebase proper, in part because
> this project requires some fairly big additions to the interface. For
> the moment I'm writing my additional persistent data out to file as
> text (which has been helpful in debugging). That said, I've made some
> small extensions to the News class to keep track of implicit and
> explicit rating values as floats, and I'm having trouble working out
> how to save and load them. I've roughly followed the methods I can
> see used to store the description, but I'm not sure how to make it
> load back in when the software starts up.

If you don't have the requirement that people can use your version of RSSOwl and then the normal in the same data without issues, then this seems ok. Or you could just add the floats to News itself, then it would just work magically.

> Also noted a possible problem - when feeds are first imported from an
> OPML file or newly added in, their News doesn't seem to be added to
> the database in the same way, as it's not triggering the listener I've
> set. Any news that comes along later is noticed just fine, though.
> Why might this be happening?

OPML doesn't usually include news, just feeds right? Ben, correct me if I am wrong.

February 21, 2009

No, I don't think it contains News either - but whenever the first batch of News is loaded from the new feed(s) it fails to trip the listener, it seems. Will do a bit more testing and get back on this.

The floats are stored directly as members of News, but they may be getting overwritten during initialization, or the News may just not get flagged as updated. I'll check this out, too.

(In good news, though, the project is working great - given a few ratings, it can start to sort News as interesting/uninteresting)

~~Chris

February 21, 2009

When feeds are imported via OPML there is no news created. RSSOwl will trigger a reload of the feeds automatically
after import and then you should see normal news events for any news downloaded during reload.

> No, I don't think it contains News either - but whenever the first batch of News is loaded from the new feed(s) it fails to trip the listener, it seems. Will do a bit more testing and get back on this.

This would be a bug and I doubt thats happening. Otherwise the imported feeds in the bookmarks view would not correctly annotate
with the number of unread news.

Ben

February 22, 2009

On further review, it definitely does trip the listener, and the news gets a predicted rated during the add event - the value just isn't showing up appropriately in the UI. Does RSSOwl duplicate or cache News objects when generating the news tables for the feed view? If so, how do I get and make changes to the original object that will be saved back to the database, and how do I ensure that the visible news is up-to-date with the original? Simply refreshing the table doesn't fix this problem, although I noted that if I swapped between open feed tabs it updated the tables with the predicted ratings.

I believe that at least some of the rating data is getting written to the database, but I'm not sure if I'll be able to diagnose that correctly until I know that the UI is reporting everything correctly, and that my changes to the displayed news are propagating correctly.

~~Chris Drouin

February 24, 2009

Bagels wrote:

> On further review, it definitely does trip the listener, and the news gets a predicted rated during the add event - the value just isn't showing up appropriately in the UI. Does RSSOwl duplicate or cache News objects when generating the news tables for the feed view? If so, how do I get and make changes to the original object that will be saved back to the database, and how do I ensure that the visible news is up-to-date with the original? Simply refreshing the table doesn't fix this problem, although I noted that if I swapped between open feed tabs it updated the tables with the predicted ratings.

Maybe your news listener is coming too late and the feed-view is always first? Did you try with a closed feed-view, reloading a feed and then displaying it? There is nothing special about the feed-view and its news, its using those from the database.

What you could also do in M9 is add a news-filter that gets triggered on every news with a chance of updating the news (e.g. set a field) before its saved to the database first. You could programmatically create this filter and contribute a news-action that does the modifications.

> I believe that at least some of the rating data is getting written to the database, but I'm not sure if I'll be able to diagnose that correctly until I know that the UI is reporting everything correctly, and that my changes to the displayed news are propagating correctly.

Is your changes small and encapsulated in your own plugin? Maybe you could send it over so that I can have a look.

February 25, 2009

> >
> > Bagels wrote:
> >>
> >> On further review, it definitely does trip the listener, and the news
> >> gets a predicted rated during the add event - the value just isn't
> >> showing up appropriately in the UI. Does RSSOwl duplicate or cache
> >> News objects when generating the news tables for the feed view? If
> >> so, how do I get and make changes to the original object that will be
> >> saved back to the database, and how do I ensure that the visible news
> >> is up-to-date with the original? Simply refreshing the table doesn't
> >> fix this problem, although I noted that if I swapped between open feed
> >> tabs it updated the tables with the predicted ratings.
> >>
> >
> > Maybe your news listener is coming too late and the feed-view is always
> > first? Did you try with a closed feed-view, reloading a feed and then

> displaying it? There is nothing special about the feed-view and its news,
> its using those from the database.

The feed-view was closed at the time of loading... this seems to happen primarily when loading News from a newly added feed. Refreshing the feedview (by changing the sorting method, for instance) doesn't fix the problem, but swapping between feedviews opened in separate tabs does. I'm at a bit of a loss here; I know that the news is successfully given a rating before I open the feed-view, but it isn't getting displayed. The news table label provider class should arguably never see a piece of unrated news, so I may be able to debug this by setting a breakpoint there and tracing my way back.

>
> What you could also do in M9 is add a news-filter that gets triggered on
> every news with a chance of updating the news (e.g. set a field) before
> its saved to the database first. You could programmatically create this
> filter and contribute a news-action that does the modifications.
>>
>> I believe that at least some of the rating data is getting written to
>> the database, but I'm not sure if I'll be able to diagnose that
>> correctly until I know that the UI is reporting everything correctly,
>> and that my changes to the displayed news are propagating correctly.
>>
>
> Is your changes small and encapsulated in your own plugin? Maybe you could
> send it over so that I can have a look.

I've tried to keep my changes encapsulated in my own packages, but I didn't feel comfortable making some of the UI changes as class extensions (I just don't know what all the classes that I'm working on are linked to, which is contributing to the problem). I'm going to keep working on this for a bit, but I will send along some examples to show some of the changes I've made once I can get them together properly. Thanks for your help!

March 1, 2009

Hey, sorry for the long wait - managed to fix the problems today. It looks like the changes to the News weren't getting saved out to the database, so I added dynamicDAO.save(this) after the rating updates - works great. It also looks like the problem with the rating values not showing initially was caused by trying to initialize the ratings on News update events... removing that fixed the problem. With that, all the basic functionality in my project is actually working more or less as it should! I'm going to keep tweaking and extending it for

the next two weeks or so, then I need to move towards testing it.

What's used to mark News as changed/needing to be updated in the database? Clearly it happens, since News gets read, etc... I could use that mechanism instead of dynamicDAO.save(), would probably be a bit cleaner. Rating saving doesn't happen frequently enough to have an impact on performance, though.

Thanks again for your help!

~~Chris Drouin

March 5, 2009

Bagels wrote:

> Hey, sorry for the long wait - managed to fix the problems today. It looks like the changes to the News weren't getting saved out to the database, so I added dynamicDAO.save(this) after the rating updates - works great. It also looks like the problem with the rating values not showing initially was caused by trying to initialize the ratings on News update events... removing that fixed the problem. With that, all the basic functionality in my project is actually working more or less as it should! I'm going to keep tweaking and extending it for the next two weeks or so, then I need to move towards testing it.

Cool! Yes, saving the news is highly desired :-).

> What's used to mark News as changed/needing to be updated in the database? Clearly it happens, since News gets read, etc... I could use that mechanism instead of dynamicDAO.save(), would probably be a bit cleaner. Rating saving doesn't happen frequently enough to have an impact on performance, though.

We always save a news when it has been modified. Sometimes not directly though, e.g. we use INewsDAO.setNewsState, which implies a save later on.

Cheers,
Ben

Appendix C – Sample XML

This sample file written to the RSS 2.0 specification comes from Harvard Law's Berkman Center (Winer). It demonstrates the <channel> and <item> elements, along with a representative sample of the additional elements (<title>, <link>, and the like) used to describe them.

```
<?xml version="1.0"?>
<rss version="2.0">
   <channel>
      <title>Liftoff News</title>
      <link>http://liftoff.msfc.nasa.gov/</link>
      <description>Liftoff to Space Exploration.</description>
      <language>en-us</language>
      <pubDate>Tue, 10 Jun 2003 04:00:00 GMT</pubDate>
      <lastBuildDate>Tue, 10 Jun 2003 09:41:01 GMT</lastBuildDate>
      <docs>http://blogs.law.harvard.edu/tech/rss</docs>
      <generator>Weblog Editor 2.0</generator>
      <managingEditor>editor@example.com</managingEditor>
      <webMaster>webmaster@example.com</webMaster>
      <item>
         <title>Star City</title>
         <link>http://liftoff.msfc.nasa.gov/news/2003/news-starcity.asp</link>
         <description>How do Americans get ready to work with Russians aboard the International
Space Station? They take a crash course in culture, language and protocol at Russia's &lt;a
href="http://howe.iki.rssi.ru/GCTC/gctc_e.htm"&gt;Star City&lt;/a&gt;.</description>
         <pubDate>Tue, 03 Jun 2003 09:39:21 GMT</pubDate>
         <guid>http://liftoff.msfc.nasa.gov/2003/06/03.html#item573</guid>
      </item>
      <item>
         <description>Sky watchers in Europe, Asia, and parts of Alaska and Canada will
experience a &lt;a
href="http://science.nasa.gov/headlines/y2003/30may_solareclipse.htm"&gt;partial eclipse of the
Sun&lt;/a&gt; on Saturday, May 31st.</description>
         <pubDate>Fri, 30 May 2003 11:06:42 GMT</pubDate>
         <guid>http://liftoff.msfc.nasa.gov/2003/05/30.html#item572</guid>
      </item>
      <item>
         <title>The Engine That Does More</title>
         <link>http://liftoff.msfc.nasa.gov/news/2003/news-VASIMR.asp</link>
         <description>Before man travels to Mars, NASA hopes to design new engines that will let
us fly through the Solar System more quickly.  The proposed VASIMR engine would do
that.</description>
         <pubDate>Tue, 27 May 2003 08:37:32 GMT</pubDate>
         <guid>http://liftoff.msfc.nasa.gov/2003/05/27.html#item571</guid>
      </item>
      <item>
         <title>Astronauts' Dirty Laundry</title>
         <link>http://liftoff.msfc.nasa.gov/news/2003/news-laundry.asp</link>
         <description>Compared to earlier spacecraft, the International Space Station has many
luxuries, but laundry facilities are not one of them.  Instead, astronauts have other
options.</description>
         <pubDate>Tue, 20 May 2003 08:56:02 GMT</pubDate>
         <guid>http://liftoff.msfc.nasa.gov/2003/05/20.html#item570</guid>
      </item>
   </channel>
</rss>
```

Appendix D – Alpha Test Data

Tester:	Session Date	Predicted Rating	Implicit Rating	Explicit Rating	Clicks	Article Length (chars)	Viewing Time	Mouse Movement (Pixels)	Frame X Size (Pixels)	Frame Y Size (Pixels)	Clickable Elements:
ma001	3/31/2009	0.537	0.288	0.25	1	2808	30641	477	741	242	10
ma001	3/31/2009	0.516	0.404	0.75	0	3856	61580	971	741	242	15
ma001	3/31/2009	0.630	0.493	0.50	0	1271	28288	249	741	242	5
ma001	3/31/2009	0.500	0.800	1.00	1	112	130460	1766	741	242	1
ma001	3/31/2009	0.574	0.498	0.25	0	144	3208	230	741	242	1
ma001	4/1/2009	0.578	0.800	1.00	0	415	25074	1126	741	242	1
ma001	4/1/2009	0.564	0.320	0.75	0	431	5696	347	741	242	1
ma001	4/1/2009	0.646	0.240	0.75	0	361	3203000	429	741	242	1
ma001	4/1/2009	0.542	0.464	1.00	0	589	12072	283	741	242	1
ma001	4/1/2009	0.525	0.284	0.75	0	2929	25659	2179	741	242	8
ma001	4/1/2009	0.562	0.224	0.75	0	3760	22239	1937	741	242	12
ma001	4/1/2009	0.558	0.534	1.00	1	4265	85493	2122	741	242	15
ma001	4/1/2009	0.527	0.800	0.75	1	2728	176936	1282	741	242	8
ma001	4/2/2009	0.500	0.524	0.75	0	1192	25097	776	741	242	3
ma001	4/8/2009	0.500	0.200	0.25	0	3934	17866	853	741	242	1
ma001	4/8/2009	0.518	0.800	1.00	0	125	75606	1327	741	242	1
ma001	4/8/2009	0.508	0.225	1.00	0	470	5037	0	741	242	1
ma001	4/8/2009	0.509	0.534	0.50	2	2252	40392	2413	741	242	7
ma001	4/8/2009	0.494	0.442	0.75	1	2511	37492	1237	741	242	7
ma001	4/8/2009	0.528	0.459	1.00	1	2951	47366	2337	741	242	9
ma002	4/1/2009	0.500	0.800	1.00	1	1368	254312	1383	747	408	1
ma002	4/2/2009	0.500	0.200	0.75	0	536	4391	48	747	409	1
ma002	4/2/2008	0.500	0.200	0.75	0	251	16	0	747	409	1
ma002	4/2/2008	0.500	0.200	0.50	0	1380	3203	0	747	354	3
ma002	4/2/2008	0.515	0.800	0.75	7	4377	228624	3512	747	367	10
ma002	4/2/2008	0.511	0.800	0.75	1	4265	276484	2144	747	367	15
ma002	4/2/2008	0.515	0.778	0.75	1	4816	169078	1037	747	367	16
ma002	4/2/2008	0.513	0.200	0.75	1	15834	115031	549	747	367	16
ma002	4/2/2008	0.510	0.602	0.75	1	2958	75625	586	747	367	11
ma002	4/5/2009	0.500	0.800	0.50	1	1087	74360	2896	747	355	1
ma002	4/5/2009	0.516	0.594	0.50	0	2777	65594	1200	747	355	9
ma002	4/5/2009	0.513	0.800	1.00	0	3732	129688	3937	747	355	13
ma003	3/31/2009	0.500	0.800	0.75	0	1368	69203	1028	571	352	1
ma003	3/31/2009	0.500	0.407	0.75	0	2291	33516	1463	571	352	1
ma003	3/31/2009	0.500	0.800	1.00	24	475	328624	7193	571	450	1
ma003	3/31/2009	1.000	0.800	1.00	0	485	59377410	6206	847	449	4
ma003	3/31/2009	0.665	0.517	0.25	0	1121	22250	3492	847	449	4
ma003	3/31/2009	0.645	0.425	1.00	0	559	8656	1972	847	449	2
ma003	3/31/2009	0.618	0.502	1.00	0	332	6359	1506	847	449	2

ma003	3/31/2009	0.612	0.236	0.75	0	2372	15344	3759	847	449	12
ma003	3/31/2009	0.558	0.793	0.75	7	1593	37406	3082	847	449	6
ma003	3/31/2009	0.545	0.719	0.75	16	3580	71438	8695	847	449	8
ma003	3/31/2009	0.542	0.800	0.75	17	772	24609	1633	847	449	2
ma003	3/31/2009	0.515	0.200	0.25	0	6239	4407	904	847	449	7
ma003	3/31/2009	0.544	0.800	0.50	1	1034	59770892	3323	847	449	1
ma003	3/31/2009	0.491	0.800	0.50	1	399	1519796	3874	847	449	1
ma003	3/31/2009	0.530	0.800	0.75	1	2521	76313	2789	847	449	1
ma003	3/31/2009	0.519	0.800	0.75	1	475	16406	1262	847	449	1
ma003	3/31/2009	0.509	0.200	0.50	0	1938	10125	655	847	449	1
ma003	3/31/2009	0.492	0.800	1.00	3	5891	354797	14045	847	449	48
ma003	3/31/2009	0.490	0.697	0.75	0	949	26969	2634	847	449	3
ma003	3/31/2009	0.468	0.533	0.75	0	1516	31250	1374	847	449	3
ma003	3/31/2009	0.492	0.200	0.25	0	2354	6297	884	847	449	1
ma003	3/31/2009	0.492	0.758	1.00	2	2451	71609	1063	847	449	7
ma003	3/31/2009	0.483	0.662	0.75	6	1583	27281	4001	847	449	3
ma003	3/31/2009	0.497	0.800	1.00	6	1525	63141	4489	847	449	1
ma003	3/31/2009	0.497	0.800	1.00	0	1119	42719	1531	847	449	4
ma003	3/31/2009	0.491	0.800	0.75	11	2283	68359	2252	847	449	6
ma003	3/31/2009	0.660	0.400	0.75	0	475	7594	589	847	449	1
ma003	4/1/2009	0.651	0.200	0.75	0	1263	10016	206	847	449	1
ma003	4/1/2009	0.633	0.800	1.00	1	694	100125	3924	847	449	6
ma003	4/1/2009	0.606	0.800	1.00	0	661	53922	1768	847	449	1
ma003	4/1/2009	0.551	0.470	1.00	0	2133	37594	2463	847	449	10
ma003	4/1/2009	0.618	0.800	1.00	3	4844	210375	6517	847	622	5
ma003	4/1/2009	0.548	0.800	1.00	2	335	94781	5944	847	622	1
ma003	4/1/2009	0.584	0.800	1.00	1	686	42563	3358	847	622	1
ma003	4/1/2009	0.894	0.800	1.00	0	577	40418890	2035	847	449	1
ma003	4/1/2009	0.656	0.200	0.75	0	1312	2016	161	847	449	7
ma003	4/1/2009	0.645	0.796	0.75	1	1832	56359	2177	847	449	4
ma003	4/1/2009	0.631	0.800	0.75	0	732	39469	1894	847	449	1
ma003	4/1/2009	0.629	0.420	0.75	0	785	11953	1796	847	449	4
ma003	4/1/2009	0.622	0.800	1.00	8	7390	323641	11301	847	449	11
ma003	4/1/2009	0.607	0.203	0.50	6	8622	13359	3496	847	449	17
ma003	4/1/2009	0.606	0.800	1.00	0	406	374938	5824	847	449	2
ma003	4/1/2009	0.782	0.200	0.50	0	1491	2531	849	847	449	6
ma003	4/1/2009	0.896	0.200	0.50	0	5313	4297	0	847	449	47
ma003	4/1/2009	0.707	0.800	0.50	0	1886	154297	4988	847	449	8
ma003	4/1/2009	0.652	0.300	1.00	0	3021	28734	4191	847	449	7
ma003	4/1/2009	0.686	0.674	0.75	1	5675	152766	8233	847	449	23
ma003	4/1/2009	0.679	0.800	0.50	1	999	62672	5292	847	449	3
ma003	4/1/2009	0.641	0.200	0.75	0	3001	2328	1322	847	449	8
ma003	4/1/2009	0.624	0.800	1.00	1	2790	139375	2721	847	449	3

ma003	4/1/2009	0.622	0.285	0.75	2	2099	12734	3034	847	449	7
ma003	4/1/2009	0.635	0.200	0.25	0	2225	3141	1380	847	449	4
ma003	4/1/2009	0.625	0.800	0.75	1	1356	159656	3121	847	449	6
ma003	4/1/2009	0.619	0.428	0.50	0	2105	32922	1771	847	449	5
ma003	4/1/2009	0.630	0.401	0.50	2	3683	17688	2786	847	449	1
ma003	4/1/2009	0.629	0.569	0.75	19	1739	22250	4190	847	449	4
ma003	4/1/2009	0.667	0.800	1.00	1	146	41139266	4775	847	662	1
ma003	4/1/2009	0.685	0.800	0.75	1	233	29844	2510	847	662	1
ma003	4/1/2009	0.597	0.800	1.00	1	256	82453	3227	847	662	1
ma003	4/1/2009	0.584	0.800	1.00	2	1476	104453	5481	847	662	2
ma003	4/1/2009	0.736	0.215	0.75	0	213	1906	239	847	662	1
ma003	4/1/2009	0.566	0.800	0.75	1	52	90078	2305	847	662	1
ma003	4/1/2009	0.565	0.290	0.75	0	1813	16422	2212	847	662	7
ma003	4/1/2009	0.547	0.800	1.00	3	204	139094	5875	847	662	1
ma003	4/2/2009	0.500	0.800	0.75	0	154	58672	2585	847	449	1
ma003	4/2/2009	0.513	0.800	1.00	1	1815	80875	2969	847	449	9
ma003	4/2/2009	0.500	0.800	0.50	1	233	29046	633	847	449	1
ma003	4/2/2009	0.548	0.800	0.75	0	415	33922	3027	847	449	2
ma003	4/2/2009	0.777	0.800	0.50	0	780	40000	2303	847	449	3
ma003	4/2/2009	0.536	0.800	0.75	0	542	23859	1536	847	449	1
ma003	4/2/2009	0.531	0.800	1.00	1	464	24860	2714	847	449	1
ma003	4/2/2009	0.700	0.800	1.00	0	1292	133515	3508	847	449	3
ma003	4/2/2009	0.627	0.200	1.00	0	3042	5016	2147	847	449	4
ma003	4/2/2009	0.665	0.756	1.00	24	3028	65812	6314	847	449	7
ma003	4/2/2009	0.587	0.200	0.75	0	2616	2438	1058	847	449	4
ma003	4/2/2009	0.586	0.658	0.75	0	971	25781	1296	847	449	1
ma003	4/2/2009	0.525	0.800	1.00	5	915	113422	3058	847	449	1
ma003	4/2/2009	0.664	0.796	1.00	0	915	34156	945	847	449	1
ma003	4/4/2009	0.641	0.734	0.75	13	5525	121156	7772	847	449	15
ma003	4/4/2009	0.614	0.800	1.00	0	336	32375	3687	847	449	2
ma003	4/4/2009	0.700	0.458	0.50	0	445	7578	2302	847	449	2
ma003	4/4/2009	0.684	0.800	0.75	0	356	22219	2110	847	449	1
ma003	4/4/2009	0.712	0.800	0.75	1	1510	52734	3471	847	449	7
ma003	4/4/2009	0.655	0.800	0.75	13	252	24813	5076	847	449	1
ma003	4/4/2009	0.650	0.516	1.00	0	927	18359	5146	847	449	4
ma003	4/4/2009	0.720	0.800	0.75	3	940	33016	5235	847	449	4
ma003	4/4/2009	0.708	0.479	0.50	0	355	6406	1408	847	449	1
ma003	4/4/2009	0.647	0.412	0.75	0	382	5672	1767	847	449	2
ma003	4/4/2009	0.623	0.767	0.75	8	4826	116562	3530	847	449	10
ma004	4/9/2009	0.500	0.200	0.75	0	1395	8250	0	1011	358	3
ma004	4/9/2009	0.500	0.200	0.75	0	1185	1906	0	1011	358	3
ma004	4/9/2009	0.500	0.200	0.75	0	2115	9891	0	1011	358	3
ma004	4/9/2009	0.500	0.200	0.75	0	1458	4890	0	1011	358	3

ma004	4/9/2009	0.500	0.200	0.75	0	1307	3454	0	1011	358	3
ma004	4/9/2009	0.492	0.200	0.75	0	6204	2140	320	1011	358	16
ma004	4/9/2009	0.492	0.208	0.75	0	3000	15360	2659	1011	358	12
ma004	4/9/2009	0.500	0.200	0.75	0	6884	17625	2602	1011	358	12
ma004	4/9/2009	0.454	0.200	0.75	0	3023	2890	0	1011	358	11
ma004	4/9/2009	0.595	0.200	0.75	0	1233	1141	0	1011	358	5
ma004	4/9/2009	0.594	0.225	0.75	0	1321	14157	0	1011	358	5
ma004	4/9/2009	0.585	0.200	0.75	0	3910	891	0	1011	358	13
ma004	4/9/2009	0.616	0.200	0.75	0	1228	4047	0	1011	358	5
ma004	4/9/2009	0.588	0.200	0.75	0	1288	7141	450	1011	358	5
ma004	4/9/2009	0.526	0.200	0.75	0	666	3891	196	1011	358	1
ma004	4/9/2009	0.566	0.200	0.75	0	595	3891	34	1011	358	1
ma004	4/9/2009	0.601	0.333	0.75	0	1779	22625	820	1011	358	6
ma004	4/9/2009	0.605	0.200	0.75	0	1282	1032	0	1011	358	5
ma004	4/9/2009	0.601	0.202	0.75	0	2062	17484	299	1011	358	6
ma004	4/9/2009	0.520	0.200	0.75	0	1393	1360	0	1011	358	3
ma004	4/9/2009	0.524	0.200	0.75	0	1425	2625	0	1011	358	3
ma004	4/9/2009	0.502	0.200	0.75	0	1049	4812	0	1011	358	3
ma004	4/9/2009	0.534	0.200	0.75	0	1027	1469	0	1011	358	3
ma004	4/9/2009	0.534	0.311	0.75	0	785	7875	1157	1011	358	3
ma005	4/1/2009	0.500	0.517	0.75	0	995	22734	338	747	243	1
ma005	4/1/2009	0.500	0.601	0.75	0	2119	51844	971	747	243	3
ma005	4/1/2009	0.500	0.800	1.00	4	2784	127703	2765	747	243	8
ma005	4/1/2009	0.500	0.452	0.75	1	2547	39203	1779	747	243	7
ma005	4/1/2009	0.500	0.200	0.50	0	2418	2844	0	747	243	10
ma005	4/1/2009	0.500	0.200	0.50	0	1290	3750	0	747	243	5
ma005	4/1/2009	0.500	0.700	0.75	0	106	5047	0	747	243	1
ma005	4/1/2009	0.500	0.200	0.50	0	1205	531	0	747	243	5
ma005	4/1/2009	0.500	0.270	0.75	0	2953	27954	897	747	243	10
ma005	4/1/2009	0.632	0.200	0.50	0	2271	3891	0	747	308	9
ma005	4/1/2009	0.624	0.200	0.25	0	66	328	0	747	308	1
ma005	4/1/2009	0.508	0.700	0.50	0	111	7187	0	747	308	1
ma005	4/1/2009	0.503	0.200	0.75	0	2084	1734000	0	747	308	6
ma005	4/1/2009	0.576	0.548	0.75	8	7479	130953	2702	747	308	20
ma005	4/1/2009	0.616	0.270	0.75	0	2672	26813	717	747	308	7
ma005	4/1/2009	0.518	0.200	0.50	0	4845	500	0	747	308	7
ma005	4/8/2009	0.537	0.520	1.00	0	1548	37969	59	1011	531	3
ma005	4/8/2009	0.496	0.219	0.75	0	11574	99953	930	1011	531	29
ma006	4/2/2009	0.500	0.800	0.75	0	146	41312	1979	1411	373	1
ma006	4/2/2009	0.500	0.200	0.50	0	1399	10078	454	1411	373	1
ma006	4/2/2009	0.563	0.778	0.75	1	2958	106109	944	1411	373	1
ma006	4/2/2009	0.594	0.743	0.75	0	446	17218	618	1411	373	1
ma007	3/31/2009	0.500	0.200	0.75	0	1520	1625	0	869	276	3

ma007	3/31/2009	0.500	0.200	1.00	0	2052	1906	0	869	276	3
ma007	3/31/2009	0.603	0.274	0.25	1	2172	21281	457	815	276	7
ma007	4/5/2009	0.589	0.800	0.25	1	1578	51375	1170	1045	643	4
ma007	4/5/2009	0.525	0.395	0.75	0	2166	38453	290	1045	643	7
ma007	4/5/2009	0.569	0.621	0.00	0	120	3547	0	1045	643	1
ma007	4/5/2009	0.578	0.700	0.00	0	52	3703	0	1045	643	1
ma007	4/5/2009	0.584	0.200	0.75	0	1093	969	0	1045	643	3
ma007	4/5/2009	0.585	0.344	0.25	0	1208	19765	0	1239	643	3
ma007	4/5/2009	0.577	0.577	0.25	0	111	5266	0	1239	643	1
ma007	4/5/2009	0.575	0.200	0.25	0	1084	3187	309	1239	643	3
ma007	4/5/2009	0.572	0.269	0.00	0	630	8063	0	1239	643	1
ma007	4/5/2009	0.570	0.200	1.00	0	834	6406	0	1239	643	3
ma007	4/5/2009	0.569	0.216	0.50	0	995	10219	0	1239	643	3
ma007	4/5/2009	0.568	0.200	0.25	0	914	7984	0	1239	643	3
ma007	4/5/2009	0.565	0.445	0.75	0	408	8641	0	1239	643	1
ma007	4/5/2009	0.559	0.800	0.75	1	2373	78750	2789	1239	643	1
ma007	4/5/2009	0.553	0.200	0.00	0	5286	7765	7765000	1239	643	19
ma007	4/5/2009	0.559	0.200	0.75	0	1474	4781	0	1239	643	5
ma007	4/5/2009	0.551	0.690	0.75	0	396	12219	540	1239	643	1
ma007	4/5/2009	0.544	0.200	0.25	0	807	5516	0	1239	643	1
ma007	4/5/2009	0.529	0.712	1.00	0	2486	92734	174	1239	643	1
ma007	4/5/2009	0.549	0.200	0.50	0	25574	30578	1437	1239	643	22
ma007	4/5/2009	0.532	0.424	0.75	1	2495	35547	2327	1239	643	8
ma008	3/31/2009	0.500	0.590	0.00	0	1489	34750	1369	747	243	1
ma008	3/31/2009	0.500	0.800	0.00	0	520	18657	1701	747	243	1
ma008	3/31/2009	0.500	0.225	0.00	0	1731	12843	722	747	243	1
ma008	3/31/2009	0.500	0.800	0.00	1	1368	83235	3446	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	1710	3578	0	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	2291	5484	792	747	243	1
ma008	3/31/2009	0.500	0.548	0.75	1	1087	12890	920	747	243	1
ma008	3/31/2009	0.500	0.800	0.25	1	399	11063	689	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	687	110	356	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	1792	11531	13	747	243	1
ma008	3/31/2009	0.500	0.800	0.00	0	478	118078	4871	747	243	1
ma008	3/31/2009	0.500	0.602	0.00	1	1400	23844	437	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	1406	2969	319	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	2351	1187	0	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	1392	4875	0	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	776	5375	98	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	776	735	102	747	243	1
ma008	3/31/2009	0.500	0.391	0.00	0	1792	27093	771	747	243	1
ma008	3/31/2009	0.500	0.293	0.75	0	1087	12188	537	747	243	1
ma008	3/31/2009	0.500	0.200	0.00	0	2787	6594	975	747	243	1

ma008	3/31/2009	0.395	0.319	0.25	0	2668	27828	1374	747	243	1
ma008	3/31/2009	0.408	0.696	0.00	0	2646	75140	2029	747	243	7
ma008	3/31/2009	0.383	0.200	0.00	0	598	4063	0	747	243	13
ma008	3/31/2009	0.385	0.266	0.50	0	2367	21375	881	747	243	7
ma008	3/31/2009	0.408	0.487	0.00	0	3427	63109	1553	747	243	7
ma008	3/31/2009	0.500	0.340	0.50	1	6603	67719	1979	747	243	8
ma008	4/1/2009	0.421	0.800	0.75	0	3524	235656	4722	1171	296	6
ma008	4/1/2009	0.463	0.800	1.00	1	536	39187	709	1171	296	1
ma008	4/2/2009	0.372	0.487	0.50	0	389	8203	539	1171	296	1
ma008	4/2/2009	0.440	0.241	0.50	0	4377	40172	799	1171	296	10
ma008	4/2/2009	0.386	0.712	0.50	0	2812	89125	690	1171	296	7
ma008	4/2/2009	0.300	0.605	0.00	0	673	16203	1241	1171	296	3
ma008	4/2/2009	0.302	0.200	0.00	0	3314	13266	1442	1171	296	17
ma008	4/2/2009	0.327	0.256	0.75	0	8835	77078	1553	1171	296	10
ma008	4/2/2009	0.340	0.200	0.50	0	1392	4953	1521	1171	296	5
ma008	4/2/2009	0.350	0.200	0.50	0	378	3782156	810	1171	296	2
ma008	4/2/2009	0.356	0.200	0.00	0	11823	15734	709	1171	296	20
ma008	4/2/2009	0.339	0.200	0.50	0	3399	7969	983	1171	296	4
ma008	4/2/2009	0.313	0.800	0.00	1	471	37921	2221	1171	296	1
ma008	4/3/2009	0.445	0.200	0.00	0	471	2875	0	1171	296	1
ma008	4/3/2009	0.419	0.716	0.50	0	431	23265	193	1171	296	1
ma008	4/3/2009	0.405	0.319	0.00	1	6157	65703	1552	1171	296	19

Appendix E – Progress Reports

The Mindful Reader – Progress Report (10/30/08)

Work completed:

- Website created and uploaded
- Meetings scheduled for B-term
- Proposal outlined, formatted, and partially developed (Abstract, Introduction, and Background have complete drafts, Procedure and Proposed Software Design are started but incomplete)
- Proposed design for filtering and behavior-measuring systems (see site)

Next Week's Goals:

- Re-organize website w/separate pages for different sections (research and links, documents and downloads, about)
- Finish drafts of Procedure and Proposed Software Design sections in the proposal
- Analyze potential platform pros and cons:
    - RSSOwl Extension
    - Standalone Java Application
    - Standalone C# Application
    - Standalone C++ Application
- Create and configure SourceForge project to host code, track issues, and lay out tasks

Near-Future Goals (2-3 Weeks):

- Full proposal draft and critique
- Begin first development iteration
- Additional reading in sources referenced in *Implicit Feedback* (Kelly & Teevan)

Discussion Questions:

- Project management… any preferred tool to use here? Should I be tracking exact hours worked, etc?
- Which of the *Implicit Feedback*-referenced papers would be most applicable to this project?
- How's the MQP proposal looking so far?
- How should I be citing references in the Background section?
- Granted that you're not directly involved in software development these days, what features would make it easiest for you to test or explore the software builds?

References for Further Study:

Budzik, J., and Hammond, K. (1999). Watson: Anticipating and contextualizing information needs. In *Proceedings of the 62nd Meeting of the American Society for Information Science*, USA, 727-740.

ACM SIGIR Special Interest Group on Information Retrieval Home Page. URL: <http://www.sigir.org/>

The Mindful Reader – Progress Report (11/06/08)

Work completed:

- Website re-organized
- Developed requirements list with importance/difficulty rankings, tiered descriptions
- Developed tentative schedule with proposed phases and weekly goals
- Explored existing RSS research
- Continued report development
- Created SourceForge site
- Updated and clarified design flowchart

Upcoming Goals:

- Contact project administrators and other key figures in RSS aggregator development projects (RSSOwl, etc. have publicly reachable figures)
    - Ask if they know of any relevant research
    - Ask what design insights they might be interested in sharing
- Expand requirements listing into full software design section

Discussion Points:

- Review tentative schedule
    - Other daily tasks?
    - Any major phases or goals missing?
- Review requirements listing
    - Should requirements be more abstract (i.e. must reduce time demands by 20% on average?)
    - What other baseline functionality is necessary?
- Review data flow chart
- How ought I approach existing project admins?
- Of the items we discussed last week, which should be highest-priority?
- Research suggests strongly that much of the net population uses RSS without actually calling it by name/knowing what it is (Grossnickle)

References for Further Study:

Grossnickle, Joshua et al. "RSS -- Crossing into the Mainstream." URL: <http://publisher.yahoo.com/rss/RSS_whitePaper1004.pdf>. October 2005.

The Mindful Reader – Progress Report (11/13/08)

Work completed:

- Major additional work on Procedure, Background sections of report
- Additional outlining of Software Design section of report
- Appendices (Site Design, Correspondences) and Works Cited added to report
- Ongoing correspondence w/Benjamin Pasero (project admin for RSSOwl)

Upcoming Goals:

- Study personal preference reference items from Tues. email
- Flesh out Software Design section of report
- Continue correspondence w/Mr. Pasero
- Complete initial draft of report (proposal version)

Discussion Points:

- Review tentative schedule
  - Other daily tasks?
  - Any major phases or goals missing?
- Review requirements listing
  - Should requirements be more abstract (i.e. must reduce time demands by 20% on average?)
  - What other baseline functionality is necessary?
- RSSOwl as a platform?

References for Further Study:

Haym Hirsh, Chumki Basu, and Brian Davison (2000).
Learning to Personalize.
Communications of the ACM, August 2000, Vol. 43, No. 8, pp. 102-106.

Learning personal preferences on online newspaper articles from user behaviors
by: Hidekazu Sakagami, Tomonari Kamba
Computer Networks and ISDN Systems, Vol. 29, No. 8-13. (September 1997), pp. 1447-1455.

User Modeling for Adaptive News Access
Daniel Billsus
Michael J. Pazzani
User Modeling and User-Adapted Interaction archive Volume 10 , Issue 2-3 (2000) table of contents
Pages: 147 - 180
Year of Publication: 2000
ISSN:0924-1868

The Mindful Reader – Progress Report (11/20/08)

Work completed:

- Research and notes on 3 preferences/implicit inference articles
- Investigated additional RSS readers and features
- Greatly expanded background section
- Developed weighted feature comparison across several different solutions

Upcoming Goals:

- Flesh out Software Design section of report
- Formalize new methods of interest prediction
- Continue correspondence w/Mr. Pasero

Discussion Points:

- Methods of interest prediction…
    - Billsus' hybrid two-model approach from News Dude, Daily Learner
    - Simple word frequencies/document vectors in ANATAGONOMY
    - Look for chains/sets of words (longer pattern recognition?)
        - Ongoing refinement of ranking as program runs?
- Explicit rankings
    - Should program display slider/indicator to show what its predictions and observations are?
        - Too visually intrusive?
    - Other possible ratings (duplicate, show me more like this, etc)?
- Platform choice…
    - Features comparison
    - Additional features to consider?
    - Weighting?

The Mindful Reader – Progress Report (12/04/08)

Work completed:

- Discovered additional sources by means of CiteseerX and similar tools
    - Incorporated notes and methods from new documents into report (background, etc)
- Contacted Joe Beck on subject of Bayesian filtering techniques (see attached letter)
- Made contact with RSSOwl dev community
- Set up development environment to evaluate RSSOwl

Upcoming Goals:

- Download code for RSSBandit, BottomFeeder to evaluate and explore
- Synthesize interest inference methods into an algorithm:
    - Naïve Bayesian filter (as described in email to Joe Beck)
    - Clamped quadratic (or higher-order) regression projection of term frequency for "gradual forgetting" of interests
    - Document vector-based similarity/duplicate checking
- Continue attempting to reach Beck
- Finish pre-development draft of report (target date: 12/15/08)

Discussion Points:

- More recent studies…
    - "Information agents" and "valets" have been studied at some length (Godoy, Macskassy)
    - Billsus' methods remain highly favored
- Additional methods
    - *n*-gram analysis – instead of full words, common 3-4 letter fragments
        - resistant to morphological variants, spelling problems
        - hard to analyze (why is "entr" a good indicator of interest?)
    - Use of thesaurus to merge indicative terms
        - Can identify useful terms more accurately
        - Domain- and language-specific
- Evaluation considerations
    - Precision vs. recall
    - Efficiency (use of processing time and memory)
        - Limit set of interest words?
        - Do processing on a per-feed basis?

Future Resources:

Sofus A. Macskassy, Aynur A. Dayanik, Haym Hirsh. "Information Valets: Adaptivity for Multi-Platform Access to Heterogeneous Information."

The Mindful Reader – Progress Report (12/11/08)

Work completed:

- Major new draft of the report
    - Citations
    - Synthesis of articles, research
    - Background on feed formats, use
    - New introduction

Upcoming Goals:

- Continue to revise report for final A-term draft.

Discussion Points:

- Go over differences between old draft and new.

The Mindful Reader – Progress Report (12/18/08)

Work completed:

- Final B-term report draft:
  - New 'Software Design' section
    - Explores RSSOwl architecture
    - Discusses software components of project
    - Subtasks for each component
  - Updated requirements, schedule, evaluation in Methodology section
  - New abstract
  - Minor fixes/updates all around
- Updated website (references section now matches + explains everything in report)

Upcoming Goals:

- Break:
  - Continue to learn about RSSOwl architecture
  - Learn more about db4o, Apache Lucene
  - Implement stub behaviors for requirements, where possible
  - Work out subtask priorities, difficulties
- Start of C-Term:
  - 1st real development iteration!

Discussion Points:

- Review software design segment
  - Any major changes necessary?
- 1st iteration goals
  - Achievable?
- Enjoy the holidays!

The Mindful Reader – Progress Report (1/19/09)

Work completed:

- Added stub functionality/test extensions to the RSSOwl Codebase
    - Implemented "rater" singleton for rating articles
    - Extended News objects to keep track of the three ratings and return the most applicable one when polled
    - Began work on extending UI to accommodate ratings + sorting by rating
- Additional research on RSS clients (particularly web-based)

Upcoming Goals:

- Software Development
    - Implement more "stubs"
    - Explore DB4o, Lucene
    - Implement explicit ranking mechanism (as slider or textbox)
- Project Proposal
    - Revise for typos/formatting issues
    - Add small section on collaborative ranking methods (AideRSS PostRank, etc)
    - Expand implementation section to

Discussion Points:

- Measuring user reading speed…
    - only use high-rated articles?
    - Minimum time / length threshold for inclusion?
- Informative terms upkeep
    - Lower weighting for terms in ignored articles… how much? Limited?
    - Negative terms – keep track of terms that seem to indicate particularly uninteresting articles, or just trust that the interesting articles will float to the top?
- Upcoming schedule…
    - Desired functionality at milestones?
    - Spacing of milestones? (weekly, bi-weekly)

The Mindful Reader – Progress Report (1/26/09)

Work completed:

- Software
  - Document vectors…
    - Vectorize article terms
    - Normalize terms (remove punctuation, capitalization differences)
    - Filter blacklisted terms
  - Informative terms
    - Object to encapsulate terms + weights + frequencies
    - Keeps track of frequency history over sessions
    - Linear regression to predict frequency in future
  - UI
    - "Rating" column (can sort by article rating)
    - Article rating UI widget (RatingBar object)
    - Rating widget linked to actual article ratings
  - Testbed
    - Testbed project to analyze Mindful Reader-specific components
- MQP Report
  - Minor tweaks/revisions
- Communications
  - Joined RSSOwl mailing list + IRC channel, learning about architecture from devs

Upcoming Goals:

- Software Development
  - Find appropriate point in-code to pull out News descriptions
  - Fix "refresh" problem w/ratings column
  - Implement simple term-based rating system
  - Make Mindful components (terms, doc vectors, interest model) persistent through DB4o
- MQP Report
  - Record communications w/RSSOwl devs
  - Document first milestone

Discussion Points:

- What other requirements will I eventually need to fill – MQP poster, etc?
- View some testbed output, early UI changes
- Was slightly hung up on the pulling-out-descriptions problem, so I moved to work on other first-milestone components + changes
- Good source of blacklist terms? (presently just added articles, pronouns, prepositions, etc off the top of my head)

The Mindful Reader – Progress Report (2/9/09)

Work completed:

- Software
    - Lots more work on document vector filtering and parsing
    - Interest model saving + loading (presently outputs text, so I can debug it easily)
    - Expanded testbed with an assortment of sample news items that embody various rankings (for my interests)
- MQP report
    - Begun system for comparing ranking algorithm performance (see attached spreadsheet)

Upcoming Goals:

- Software Development
    - Ensure articles do not get rated and inserted into interest model *twice*, at least unless user is changing their explicit rating
    - Fix up rating bar (change to slider, add space on top so it obviously belongs to article, make starting rating reflect predicted value)
    - Implement stub implicit rating system (based on viewing time for now)
    - Continue work on ranking algorithms
    - Work out various file-output errors (occasionally missing carriage-returns, which breaks everything)
- MQP Report
    - Work in algorithm comparison section

Discussion Points:

- Go over algorithm comparison

The Mindful Reader – Progress Report (2/16/09)

Work completed:

- Software
  - Fixed save-interests problems (wasn't flushing the buffer)
  - Articles can only be rated once by each method (implicit/explicit)
  - Updated rating bar (see attached screenshot on next page) to use scale, tooltips
  - Updated rating column in table – now uses +2, +1, 0, -1, -2, with color gradient showing finer-detailed rating
  - Stub implicit rating system implemented – presently does not refresh the feed view after giving an implicit rating, however
  - Fixed and updated both algorithms
- MQP report
  - Continued to update algorithm comparison (see attached)

Upcoming Goals:

- Software Development
  - Implicit ratings…
    - Pause when browser is minimized/out-of-focus
    - Finalize rating when feedview is switched
    - Constant bonus when article is double-clicked (opened in external browser)
  - Rating algorithms
    - Experiment with fuzzy logic/NBC method (see discussion below)
- MQP Report
  - Document second iteration progress

Discussion Points:

- Fuzzy Logic and Naïve Bayes Classifiers…
  - NBC is best at sorting articles into discrete classes
  - Previous attempts used only two discrete classes (interesting/not interesting), whereas we have at minimum 5 classes (-2, -1, 0, +1, +2)
  - Could we use fuzzy logic style blending to merge results of 5 NBCs (one for each explicit ranking) into a more accurate final value?
- Implicit rating system
  - Based on number of characters read per minute vs. average characters per minute (assuming 300wpm and ~6 characters, including punctuation/whitespace, per word)
  - Bounded, so that no article will be implicitly rated higher than +1 or lower than -1
- UI
  - Red-to-green shift for article rankings – impact on readability? Trouble for colorblind users?
  - Scale w/tooltips – good solution for explicit rating bar? Too big?

The Mindful Reader – Progress Report (2/23/09)

Work completed:

- Software
  - Now tracks + saves distribution of classifications (+2, +1, etc) for each term
  - Begun work on 'voting' system for Naïve Bayes Classifiers
  - Persists News rating data between sessions (buggy – working on this)
  - Tweaks to user interface based on previous meeting
- MQP report
  - Updated w/report on second iteration
  - Informal testing on reading speed (see discussion below)

Upcoming Goals:

- Software
  - Work out differences between displayed News and internal representation (cached or copied?)
  - Implement additional implicit metrics
  - Finish implementation of NBC voting
  - Find out how to package RSSOwl for a release (so it can run separately from the development environment)
- MQP report
  - Keep on trucking…

Discussion Points:

- NBC voting…
  - Discuss how this should work – should we end up picking a rating in line with one of the existing classifications? do a regression of some sort on the "votes" to find the highest point in the distribution?
- Reading speed
  - See below
  - Varies a fair bit (850cpm to 2500cpm)
  - Use as a discrete indication (read/did not read) rather than on a continuous scale?
  - People seem to take proportionally longer on shorter articles

Document 1 (Source: BoingBoing)			
Words:	Characters:		
274	1439		
Tester #:	Time (s):	WPM:	CPM:
1	33.1	496.7	2608.5
2	78.4	209.7	1101.3
3	76.8	214.1	1124.2
4	37.0	444.3	2333.5

Document 2 (Source: CNN)			
Words:	Characters:		
78	512		
Tester #:	Time (s):	WPM:	CPM:
1	12.9	362.8	2381.4
2	32.7	143.1	939.4
3	36.1	129.6	851.0
4	17.8	262.9	1725.8

The Mindful Reader – Progress Report (3/2/09)

Work completed:

- Software
  - Now tracks distribution of articles across classes + number of articles seen
  - Rating data persists correctly between sessions
  - Voting classifiers system implemented – see discussion
  - Additional instrumentation (tracks mouse movement + clicks when over the article panel)
  - Exported to stand-alone package (for future evaluation)

Upcoming Goals:

- Software
  - Work mouse movement/clicks metrics in to implicit rating system
  - Look into comparing article document vectors for similarity testing (to weed out duplicate articles)
  - Bug: Articles still not always getting a predicted rating on load – seems to be source-dependent, only occurs with certain feeds.
- MQP report
  - Set up user evaluation scheme

Discussion Points:

- NBC voting…
  - May require much more training data than 'weighted average' method
  - Tends to default to the class of article most frequently seen (for me, this has been '+1' ratings)
  - Possibly wonky math… method I've seen reference dividing results by probability of a document existing with a given set of terms. This can be calculated, but it yields a vanishingly tiny probability – dividing by that yields definitely non-probability values (greater than 1.0) as a result. Will ask around for help with this – maybe there is a different interpretation of the probability of a doc existing.
- Evaluation…
  - Alternate methods of rating? (switch between weighted ave and Bayes classifiers every other session)
  - Time/interest-model-size progression?
    - No rating -> Weighted Average -> Bayes Classifiers
  - Initial instructions to users…
    - How to subscribe to news feeds
    - How to rate articles
    - Underlying mechanisms (implicit rating, etc)?

Mindful Reader – Thursday, March 12, 2009

Discussion Points:

- What controllable variables do we want to test?
    - Different prediction models for article rating?
    - Use of implicit and/or explicit feedback mechanisms?
        - Implicit only
        - Explicit only
        - Both mechanisms
        - Explicit w/prompting ("Please rate this article…")
    - Weighting of different implicit feedback factors?
        - Time spent viewing
        - Mouse clicks on article
        - Mouse movement over article
- What data do we want to gather?
    - Objective (gathered automatically in background)
        - Session lengths + dates
        - # of sessions
        - # of articles read per session
        - Avg. article lengths
        - Distribution of explicit ratings for articles
        - Distribution of implicit ratings for articles
        - Difference between predicted rating and explicit/implicit rating per article or session
    - Subjective (gathered through survey or feedback form)
        - Perception of recommendation value (is it usually 'right'?)
        - Perception of learning time (how long did it take to train to a satisfactory state?)
        - Comparison to other aggregators (more efficient? easier to use?)
- How should the software be distributed and promoted?
    - Open distribution online?
    - Controlled distribution within WPI?
- Meeting times for D-Term…
    - Times blocked:
        - Monday – 10-11am, 12-2pm
        - Tuesday – 10-11am, 12-3pm
        - Wednesday – 12-2pm
        - Thursday – 10-11am
        - Friday – 10-11am, 12-3pm

Mindful Reader – Thursday, March 27, 2009

Work completed:

- Software
    - Implemented various forms of normalization for implicit rating factors (reading speed, mouse clicks, mouse movement)
    - Implemented rating journaling (records information about all three kinds of ratings for testing purposes)
    - Set default sorting mechanism to the Mindful Reader rating
- Testing
    - Packaged Mindful Reader w/user instructions for distribution

Upcoming Goals:

- Software
    - Tweak rating techniques, UI based on first-round testing
- Testing
    - IRB approval?
    - Distribute Mindful Reader to small group of testers
    - Keep in contact w/testers (reminders to use software, etc)
- Writeup
    - Discuss first-round testing, data recording methods
    - Finalize implementation section

Discussion Points:

- Testing methods…
    - Should everyone get the same distribution, or should some elements (weighting of implicit rating components, for instance) be varied from tester to tester?
    - What should be provided as the initial mix of feeds for new users?
        - Mine is fairly tech/game-news heavy…
- Writeup…

What points to cover on testing? (getting testers for this research, data recording methods, communications w/testers, etc.)

Mindful Reader – Thursday, April 2, 2009

Work completed:

- Software
  - Added rating increment/decrement buttons
  - Rating bar is disabled whenever viewing an already-rated article
  - Created proper installer w/license, readme, uninstaller
- Testing
  - Tested basic deployment prior to release
  - Got 9 volunteers (via email and in person)
  - Released via links sent out in email
- Report
  - Discussed testing phases, methodology, results so far
  - Draft of segment discussing algorithm design for rating prediction and implicit rating measurement

Upcoming Goals:

- Software
  - Come up with solution for "jumping" behavior (see discussion points)
  - Prepare data gathering methods for second-phase testing
- Testing
  - Remind testers periodically to run the software
  - Gather test result data (due next Wednesday)
  - Analyze data, find best weightings for implicit rating algorithm
- Writeup
  - Discuss first-round testing results
  - Finalize implementation section

Discussion Points:

- Early tester feedback
  - Much confusion over inability to change ratings – all admit that they would rarely do this, but lacking this ability makes users uncomfortable.
  - Behavior after making a rating is awkward – the news listing automatically re-sorts, which can cause the selected article (and the view of the listing) to jump around dramatically.
    - Move to next highest-rated, unread article after rating is made?
    - Base sorting on predicted rating only, so that article does not change position?
- Report – testing segment draft

Mindful Reader – Thursday, April 9, 2009

Work completed:

- Testing
  - First round of testing complete
  - Datasets from 7 people, survey responses from 5
- Report
  - Section 4 (Software Design) completely overhauled (rewritten, updated w/correct flow-charts and algorithms)
  - Section 5 (Implementation) updated through Alpha Release

Upcoming Goals:

- Software
  - Implement "jumping" behavior fixes (apply explicit rating when user switches articles)
  - Change default feed update behavior (should update-on-startup, but this is off
  - Update implicit feedback weights w/optimal values from alpha test
  - Instrument software for beta test phase:
    - record results from both prediction models (weighted ave + classifiers)
    - continue to record implicit + explicit ratings
- Testing
  - Crunch the data received from the alpha test
  - Send out request for beta testers to CS-majors
- Writeup
  - Update sections 3 (process) and 6 (evaluation)
  - Do misc. cleanup on sections 1 (introduction) and 2 (background)
  - Add appendices for datasets, code
- Presentation
  - Draft the Project Presentation Day presentation and poster

Discussion Points:

- Survey feedback:
  - All users reported finding at least some interesting articles amongst top-5 rated, but it was a wide spread (two found 3 and 4, but also two that only found 1 interesting article on average)
  - Some users would prefer an alternate rating representation (for instance, a set of circles/stars that cut off to represent the article rating)
  - Users want article age to be a consideration in ranking – perhaps sort first by day, then by rating?
- Presentation prep…
  - What topics to discuss in a 15-min presentation? (intro to concept of newsfeeds, project goals, interface design, brief summary of algorithms, eval methods…)

Mindful Reader – Thursday, April 16, 2009

Work completed:

- Software
  - Changed default behavior to update feeds on startup
  - Fixed up classifier-based prediction mechanism (it now works well enough to use as the primary prediction mechanism)
  - Fixed "jumping" behavior (ratings defer until user switches articles), added "*" marking to rated articles
  - Created a normal-UI version of the software for control group
- Testing
  - Got 14 volunteers (10 new, 4 returners)
    - 12 main group, 2 control group
  - Released via links sent out in email
  - Sending periodic reminders (every 2 days?) to use the software
- Report
  - Updated abstract
  - Reviewed sections 1 & 2… they are in good shape.
  - Reworked section 3 (design & requirements) – still need to update schedule section, though
  - Updated section 5 (beta release details)
  - Tons of new analysis in Section 6

Upcoming Goals:

- Software
  - Fix any major bugs noted by testers (none so far…)
- Testing
  - Remind testers periodically to run the software
  - Gather test result data (due next Wednesday)
  - Analyze data, compare control group use to full Mindful Reader use
- Writeup
  - Finish updating section 3
  - Testing results/analysis of beta test for Section 6
  - Conclusion section
  - Polish!

Discussion Points:

- Go over some data from alpha test (attached)
- Go over Project Presentation Day draft presentation
- Survey design for end of beta test… we may want to be able to tie survey results to experimental data from software (Surveymonkey is anonymous…)

Appendix F – Beta Test Data

Survey responses:

Have you used a newsfeed (RSS, Atom, etc.) aggregator such as Google Reader, NewsGator, RSSOwl, or Thunderbird before? (9 responses)	*Yes*	*No*
	4	5

On average, about how much time per day do you spend browsing news websites and/or blogs with regularly posted new content? (9 responses)	*< 15 minutes*	*15-30 minutes*	*30-45 minutes*	*> 45 minutes*
	0	4	2	3

When you gave a rating for an article using the rating slider, which of the following motivated you? (check all that apply) (8 responses)	*Provide an example of an interesting article*	*Provide an example of an uninteresting article*	*Correct a bad prediction*	*Reinforce a correct prediction*
	8	4	3	3

By the end of your time testing the Mindful Reader, how accurate do you feel it was in predicting how interesting a new article would be to you? (8 responses)	*Very inaccurate*	*Somewhat inaccurate*	*Somewhat accurate*	*Very accurate*
	0	1	7	0

When deciding whether or not to read a given article, how influential did you consider the following factors? (8 responses)	*Not influential*	*Somewhat influential*	*Very influential*
Predicted Rating	4	3	1
Article Age	3	3	2
Article Title	0	2	6
Article Author	5	2	1
Feed/Source	1	4	3

If you have used another feed aggregator (Google Reader, Thunderbird, NewsGator, etc), did you feel that using the Mindful Reader made it easier or harder to find interesting articles quickly, compared to the other aggregator(s)? (5 responses)	*Much harder*	*Somewhat harder*	*Somewhat easier*	*Much easier*
	0	4	1	0

What suggestions or additional comments do you have on the Mindful Reader project? (5 responses)

> Be able to rate things without clicking off the item you're on! Also, don't just automatically make something -1 because you clicked it and didn't read it.
>
> I was surprised by the granularity of predictions. It was able to predict the general types of articles that I like, even when there were different types of articles within a feed.
>
> Overall a cool project that would be more useful if I didn't read every post anyway.
>
> My preference for chronological reading aside, I think it might be useful to be able to disable ratings for certain feeds --- for example, webcomic feeds consisting solely of one image per post, which [I think] the prediction algorithm can't do very much with.
>
> **.**While I can understand why such a thing might be useful to some, I believe my tastes in news are not easily categorized. I like to read articles on 'important' things, where important is loosely defined. Subject matter rarely is of consequence.

Test Group Data:

Tester	Session #	Date	Average Predicted Rating	Bayes Predicted Rating	Implicit Rating	Explicit Rating	Clicks	Article Length (chars)	Viewing Time (ms)	Mouse Movement (Pixels)	Frame X Size (Pixels)	Frame Y Size (Pixels)	Clickable elements
mb001	1	4/21/2009	0.500	0.500	0.534	0.750	0	535	39605824	71	741	241	1
mb001	1	4/21/2009	0.500	0.500	0.532	1.000	0	7333	102438	1503	741	241	3
mb001	1	4/21/2009	0.500	0.500	0.800	0.500	0	499	54647	833	741	241	1
mb001	1	4/21/2009	0.500	0.500	0.300	-1.000	0	430	7729	0	741	241	1
mb001	1	4/21/2009	0.556	0.500	0.800	0.750	0	397	46723744	1469	741	241	1
mb001	1	4/21/2009	0.250	0.500	0.535	-1.000	0	430	8569	414	741	241	1
mb001	1	4/21/2009	0.500	0.500	0.800	0.750	0	508	339274	2181	741	241	1
mb001	1	4/21/2009	1.000	0.500	0.200	-1.000	0	570	721	0	741	241	1
mb001	1	4/21/2009	0.518	1.000	0.486	0.750	0	523	8535	444	741	241	1
mb001	1	4/21/2009	1.000	1.000	0.486	0.500	0	725	8830	612	741	241	1
mb001	1	4/21/2009	0.556	1.000	0.558	0.750	0	10550	100208	2384	1153	331	7
mb001	1	4/21/2009	1.000	1.000	0.200	0.250	0	2088	3495	0	1153	331	6
mb001	1	4/21/2009	1.000	1.000	0.391	0.500	0	2140	13993	979	1153	331	7
mb001	1	4/21/2009	1.000	1.000	0.559	1.000	0	2452	23457	2203	1153	331	6
mb001	1	4/21/2009	1.000	1.000	0.800	-1.000	1	3441	8977018	2093	1153	331	7
mb001	1	4/21/2009	0.750	1.000	0.800	-1.000	0	2466	16142328	2267	1153	331	8
mb001	1	4/21/2009	0.750	1.000	0.200	0.250	0	2846	1829	333	1153	331	8
mb001	1	4/21/2009	0.542	1.000	0.200	0.250	0	3651	3500	144	1153	331	8
mb001	1	4/21/2009	0.750	1.000	0.800	0.750	0	523	76878992	7464	1153	331	1
mb001	1	4/21/2009	0.488	0.257	0.406	0.250	0	967	16531	383	1153	331	1
mb001	1	4/21/2009	0.750	0.750	0.800	1.000	1	2101	14447372	2205	1153	331	1
mb001	1	4/21/2009	0.970	1.000	0.355	-1.000	0	509	5324	546	1153	331	1
mb001	1	4/21/2009	0.818	1.000	0.577	0.250	0	514	40439	233	1153	331	1
mb001	1	4/21/2009	1.000	1.000	0.200	0.250	0	6093	1719	544	1153	331	32
mb002	1	4/14/2009	0.500	0.500	0.591	0.250	0	8550	97915	2599	741	462	2
mb002	1	4/14/2009	0.500	0.500	0.203	0.750	0	6497	6955	862	741	462	7
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	8677	6809	743	741	462	14
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	6350	11859	501	741	462	6
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	453	0	0	741	462	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	10802	0	0	741	462	7
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	482	698	0	741	462	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1840	0	0	741	462	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2139	3874	215	741	462	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	8175	3825	0	741	462	14
mb002	1	4/14/2009	0.500	0.500	0.273	0.750	0	324	4198	113	741	242	1
mb002	1	4/14/2009	0.500	0.500	0.586	0.500	0	1174	13693	925	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.469	0.750	0	396	11154	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	315	1932	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	382	1968	0	741	350	1

mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	1411	483	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	167	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	746	314	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	969	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	4520	4166	0	741	242	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2076	7198	0	741	242	2
mb002	1	4/14/2009	0.500	0.500	0.200	1.000	0	3284	2338	139	741	242	3
mb002	1	4/14/2009	0.500	0.500	0.200	1.000	0	5056	426	237	741	242	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2054	4324	266	741	242	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	8586	0	0	741	242	18
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2756	4119	441	741	242	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	4677	1983	234	741	242	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	6691	1698	188	741	242	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	7393	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	16594	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	15448	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	28222	56	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	17557	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	-1.000	0	31523	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	14139	6055	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	27681	8308	195	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	9296	808	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	10119	322	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	25717	404	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	30502	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	18756	897	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	32988	4698	262	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2562	0	0	741	350	6
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	1761	3212	105	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	3261	3002	391	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	5514	2305	346	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	3238	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	5366	415	306	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2895	964	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	3546	0	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	4492	0	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.800	0.750	4	5585	132575	3488	741	350	5
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1230	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1058	1124	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1340	1690	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1895	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1183	3775	97	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	2747	990	0	741	350	1

mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1185	881	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1057	753	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1388	4887	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1619	51	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	2154	1117	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1659	113	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1483	388	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1197	2239	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	1121	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1016	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1609	0	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1320	588	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	1091	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1058	305	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1244	374	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1438	2841	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1103	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1538	271	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1587	105	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1281	0	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	2036	0	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1711	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1022	0	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1009	92	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	4045	1566	0	741	350	7
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1758	2148	0	741	350	7
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	622	328	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1717	2006	0	741	350	4
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	723	141	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	706	897	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	1604	1033	0	741	350	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	4431	0	0	741	350	10
mb002	1	4/14/2009	0.500	0.500	0.200	0.250	0	735	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	780	0	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	820	573	0	741	350	2
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	472	0	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.200	0.500	0	660	228	0	741	350	1
mb002	1	4/14/2009	0.500	0.500	0.618	0.500	0	1797	71220	311	741	207	3
mb002	1	4/14/2009	0.750	0.500	0.329	0.750	0	1808	34584	28	741	207	3
mb002	1	4/14/2009	0.500	0.500	0.431	0.250	0	1559	29388	295	741	207	3
mb002	1	4/14/2009	0.501	0.500	0.289	0.750	0	963	16709	0	741	207	3
mb002	1	4/14/2009	0.750	0.500	0.500	0.750	0	1085	35303	0	741	207	3
mb002	1	4/14/2009	0.500	0.500	0.200	0.750	0	1126	11800	0	741	207	3

mb002	1	4/14/2009	0.750	0.500	0.290	0.500	0	1160	20194	0	741	207	3
mb002	1	4/14/2009	0.500	0.500	0.246	0.500	0	1305	19268	0	741	207	3
mb002	1	4/14/2009	0.745	0.500	0.266	0.500	0	812	8035	223	741	207	3
mb002	1	4/14/2009	0.750	0.500	0.245	0.500	0	1001	7480	276	741	207	3
mb002	1	4/14/2009	0.747	0.500	0.496	0.500	0	1436	21258	617	741	207	3
mb002	1	4/14/2009	0.499	0.500	0.507	0.750	1	1362	21144	525	741	207	3
mb002	1	4/14/2009	0.500	0.500	0.290	0.250	0	1209	6374	479	741	207	3
mb002	1	4/14/2009	0.747	0.500	0.413	0.500	1	1481	12311	602	741	207	3
mb002	2	4/15/2009	0.530	0.748	0.200	0.750	0	1502	1114	0	741	208	3
mb002	2	4/15/2009	0.528	0.625	0.200	0.250	0	2373	5228	0	741	208	3
mb002	2	4/15/2009	0.512	0.613	0.200	0.750	0	1392	174	0	741	208	3
mb002	2	4/15/2009	0.507	0.500	0.487	0.500	0	1128	28179	166	741	208	3
mb002	2	4/15/2009	0.485	0.256	0.784	0.500	0	1437	35733	913	741	208	3
mb002	2	4/15/2009	0.488	0.256	0.200	0.500	0	1067	872	204	741	208	3
mb002	2	4/15/2009	0.750	0.500	0.200	0.500	0	1001	194	0	741	208	3
mb002	2	4/15/2009	0.514	0.501	0.545	0.500	0	131	14315	86	741	302	1
mb002	2	4/15/2009	0.642	0.750	0.242	0.500	0	280	4064	0	741	302	1
mb002	2	4/15/2009	0.564	0.750	0.500	0.750	0	94	10394	0	741	302	1
mb002	2	4/15/2009	0.547	0.750	0.800	0.750	0	1369	33657	1207	741	411	3
mb002	2	4/15/2009	0.544	0.748	0.265	0.500	0	1227	3951	503	741	411	3
mb002	2	4/15/2009	0.531	0.730	0.260	0.750	0	1701	26584	0	741	411	3
mb002	2	4/15/2009	0.517	0.502	0.315	0.750	0	1753	30216	73	741	411	3
mb002	2	4/15/2009	0.526	0.502	0.207	0.500	0	1496	11192	205	741	411	3
mb002	2	4/15/2009	0.539	0.500	0.298	0.500	0	1485	26584	0	741	411	3
mb002	2	4/15/2009	0.509	0.500	0.285	0.750	0	1316	22483	0	741	411	3
mb002	2	4/15/2009	0.504	0.500	0.484	-1.000	2	1359	19407	438	741	411	3
mb002	2	4/15/2009	0.528	0.500	0.204	1.000	0	1501	18348	0	741	411	3
mb002	2	4/15/2009	0.534	0.500	0.200	0.500	0	1649	8889	0	741	411	3
mb002	2	4/15/2009	0.535	0.500	0.364	0.250	0	1691	22004	380	741	411	3
mb002	2	4/15/2009	0.500	0.500	0.200	0.500	0	1797	0	0	741	411	3
mb002	2	4/15/2009	0.517	0.500	0.392	0.500	0	966	13215	372	741	411	3
mb002	2	4/15/2009	0.511	0.500	0.200	0.500	0	1276	6287	0	741	411	3
mb002	3	4/16/2009	0.500	0.500	0.200	0.500	0	1100	0	0	741	303	3
mb002	3	4/16/2009	0.745	0.745	0.200	0.500	0	1053	3100	0	741	303	3
mb002	3	4/16/2009	0.750	0.750	0.200	0.750	0	1261	0	0	741	303	3
mb002	3	4/16/2009	0.518	0.748	0.401	0.750	0	1129	25007	75	741	303	3
mb002	3	4/16/2009	0.547	0.747	0.359	0.750	0	1334	21211	229	741	303	3
mb002	3	4/16/2009	0.541	0.609	0.639	0.750	0	1212	34494	392	741	303	3
mb002	3	4/16/2009	0.533	0.502	0.561	0.500	0	1186	28305	386	741	303	3
mb002	3	4/16/2009	0.551	0.501	0.678	0.750	1	983	14407	1119	741	303	3
mb002	3	4/16/2009	0.541	0.500	0.200	0.500	0	1132	10206	0	741	303	3
mb002	3	4/16/2009	0.510	0.500	0.581	0.750	0	1317	40164	196	741	303	3
mb002	3	4/16/2009	0.500	0.500	0.200	0.500	0	1538	0	0	741	303	1

mb002	3	4/16/2009	0.610	0.500	0.200	0.750	0	1319	10287	99	741	303	3
mb002	3	4/16/2009	0.580	0.747	0.200	0.500	0	1079	0	0	741	303	3
mb002	3	4/16/2009	0.559	0.613	0.200	0.500	0	1386	909	0	741	303	3
mb002	3	4/16/2009	0.547	0.613	0.200	0.750	0	1759	959	0	741	303	3
mb002	3	4/16/2009	0.560	0.613	0.280	0.500	0	1166	15410	140	741	303	3
mb002	3	4/16/2009	0.555	0.604	0.216	0.750	0	1114	14420	0	741	303	3
mb002	3	4/16/2009	0.538	0.500	0.200	0.750	0	1043	4032	0	741	303	3
mb002	4	4/17/2009	0.550	0.441	0.200	1.000	0	1145	2789	88	741	303	3
mb002	4	4/17/2009	0.528	0.250	0.800	0.750	3	1155	185144	1947	741	303	3
mb002	4	4/17/2009	0.555	0.750	0.200	1.000	0	1287	2037	0	741	303	3
mb002	4	4/17/2009	0.559	0.750	0.200	0.500	0	1234	520	0	741	303	3
mb002	4	4/17/2009	0.572	0.748	0.200	0.250	0	1265	57	0	741	303	3
mb002	4	4/17/2009	0.571	0.615	0.200	0.750	0	1317	0	0	741	303	3
mb002	4	4/17/2009	0.575	0.501	0.200	0.750	0	904	1255	93	741	303	3
mb002	4	4/17/2009	0.551	0.500	0.200	0.500	0	1413	4316	0	741	303	3
mb002	4	4/17/2009	0.542	0.500	0.200	0.500	0	1768	557	32	741	303	3
mb002	4	4/17/2009	0.579	0.500	0.200	0.500	0	1188	2970	0	741	303	3
mb002	5	4/18/2009	0.564	0.750	0.200	0.750	0	1545	542	0	741	303	3
mb002	5	4/18/2009	0.572	0.750	0.200	0.500	0	1270	0	0	741	303	3
mb002	5	4/18/2009	0.531	0.747	0.200	0.500	0	2168	0	0	741	303	3
mb002	5	4/18/2009	0.556	0.747	0.200	0.500	0	1058	0	0	741	303	3
mb002	5	4/18/2009	0.563	0.747	0.200	0.750	0	1521	0	0	741	303	3
mb002	5	4/18/2009	0.534	0.614	0.200	1.000	0	1627	0	0	741	303	3
mb002	5	4/18/2009	0.550	0.502	0.200	0.500	0	1148	12306	0	741	303	3
mb002	5	4/18/2009	0.502	0.502	0.200	-1.000	0	1054	0	0	741	303	3
mb002	5	4/18/2009	0.540	0.500	0.200	0.500	0	1654	10078	76	741	303	3
mb002	5	4/18/2009	0.545	0.500	0.403	0.750	0	1609	30569	220	741	303	3
mb002	5	4/18/2009	0.530	0.500	0.354	0.500	0	1391	29557	0	741	303	3
mb002	5	4/18/2009	0.527	0.499	0.377	0.500	0	1254	21766	209	741	303	3
mb002	5	4/18/2009	0.539	0.270	0.200	0.500	0	1293	650	0	741	303	3
mb002	6	4/19/2009	0.537	0.500	0.200	0.500	0	1292	82	0	741	303	3
mb002	6	4/19/2009	0.560	0.610	0.200	0.500	0	1365	0	0	741	303	3
mb002	6	4/19/2009	0.540	0.510	0.200	0.500	0	1831	1039	0	741	303	3
mb002	6	4/19/2009	0.538	0.750	0.200	0.500	0	1012	0	0	741	303	3
mb002	6	4/19/2009	0.549	0.750	0.200	-1.000	0	1536	0	0	741	303	3
mb002	6	4/19/2009	0.575	0.750	0.200	-1.000	0	1004	45	25	741	303	3
mb002	6	4/19/2009	0.557	0.502	0.200	0.750	0	1643	0	0	741	303	3
mb002	6	4/19/2009	0.530	0.502	0.200	1.000	0	1080	375	0	741	303	3
mb002	6	4/19/2009	0.552	0.500	0.200	0.500	0	1277	229	0	741	303	3
mb002	6	4/19/2009	0.556	0.500	0.200	0.500	0	1341	0	0	741	303	3
mb002	6	4/19/2009	0.555	0.500	0.200	0.500	0	1466	0	0	741	303	3
mb002	6	4/19/2009	0.524	0.500	0.200	0.250	0	1723	158	0	741	303	3
mb002	6	4/19/2009	0.555	0.750	0.200	0.750	0	1069	2112	0	741	303	3

mb002	6	4/19/2009	0.535	0.500	0.200	0.500	0	1203	0	0	741	303	3
mb002	7	4/20/2009	0.615	0.750	0.200	0.750	0	1069	2117	0	741	303	3
mb002	7	4/20/2009	0.576	0.747	0.241	0.500	0	1212	15624	61	741	303	3
mb002	7	4/20/2009	0.537	0.623	0.374	0.750	0	1897	17895	578	741	303	3
mb002	7	4/20/2009	0.550	0.502	0.200	0.500	0	1108	0	162	741	303	3
mb002	7	4/20/2009	0.551	0.502	0.242	0.500	0	1634	13227	273	741	303	3
mb002	7	4/20/2009	0.555	0.502	0.200	0.250	0	1123	1920	0	741	303	3
mb002	7	4/20/2009	0.545	0.502	0.200	0.250	0	1340	0	0	741	303	3
mb002	7	4/20/2009	0.536	0.500	0.200	0.750	0	1469	3842	0	741	303	3
mb002	7	4/20/2009	0.509	0.500	0.200	0.500	0	1681	0	0	741	303	3
mb002	7	4/20/2009	0.556	0.606	0.200	0.750	0	1505	4364	0	741	303	3
mb002	7	4/20/2009	0.519	0.500	0.200	0.750	0	1758	0	0	741	303	3
mb002	7	4/20/2009	0.534	0.499	0.200	0.250	0	1805	0	0	741	303	3
mb002	7	4/20/2009	0.516	0.443	0.200	0.750	0	1059	0	0	741	303	3
mb002	7	4/20/2009	0.535	0.750	0.200	1.000	0	1434	429	0	741	303	3
mb002	7	4/20/2009	0.545	0.747	0.200	0.500	0	1315	725	0	741	303	3
mb002	7	4/20/2009	0.582	0.608	0.200	0.750	0	1019	541	0	741	303	3
mb002	7	4/20/2009	0.540	0.608	0.200	0.500	0	1205	11559	4	741	303	3
mb002	7	4/20/2009	0.523	0.608	0.200	0.750	0	866	0	156	741	303	3
mb002	7	4/20/2009	0.559	0.500	0.200	0.750	0	1154	0	62	741	303	3
mb002	7	4/20/2009	0.523	0.500	0.200	1.000	0	1496	0	0	741	303	3
mb002	7	4/20/2009	0.544	0.500	0.200	0.250	0	1267	353	0	741	303	3
mb002	7	4/20/2009	0.519	0.500	0.200	0.500	0	1112	6074	237	741	303	3
mb002	7	4/20/2009	0.531	0.500	0.200	0.500	0	1298	11980	59	741	303	3
mb002	7	4/20/2009	0.546	0.747	0.479	0.500	0	370	10633	0	741	303	1
mb002	7	4/20/2009	0.500	0.500	0.200	0.750	0	969	0	0	741	303	1
mb002	8	4/21/2009	0.554	0.750	0.200	0.500	0	1218	6736	0	741	303	3
mb002	8	4/21/2009	0.574	0.747	0.200	0.500	0	1298	0	80	741	303	3
mb002	8	4/21/2009	0.565	0.607	0.438	0.500	0	1488	15200	668	741	303	3
mb002	8	4/21/2009	0.529	0.607	0.200	0.750	0	1216	185	0	741	303	3
mb002	8	4/21/2009	0.567	0.502	0.200	0.750	0	1045	0	0	741	303	3
mb002	8	4/21/2009	0.567	0.500	0.200	0.750	0	1354	0	0	741	303	3
mb002	8	4/21/2009	0.554	0.500	0.200	0.500	0	1646	0	0	741	303	3
mb002	8	4/21/2009	0.509	0.500	0.200	0.500	0	1549	1767	0	741	303	3
mb002	8	4/21/2009	0.526	0.500	0.200	0.500	0	1111	0	0	741	303	3
mb002	8	4/21/2009	0.539	0.500	0.200	0.500	0	1298	0	0	741	303	3
mb002	8	4/21/2009	0.509	0.500	0.200	0.500	0	1681	0	0	741	303	3
mb002	8	4/21/2009	0.515	0.500	0.200	0.500	0	1407	1859	0	741	303	3
mb002	8	4/21/2009	0.503	0.750	0.342	-1.000	0	2222	17451	595	741	303	1
mb002	8	4/21/2009	0.561	0.747	0.327	0.500	0	520	10199	0	741	303	1
mb002	8	4/21/2009	0.556	0.747	0.272	0.750	0	998	14502	67	741	303	3
mb002	8	4/21/2009	0.544	0.502	0.200	0.500	0	1391	1344	0	741	303	3
mb002	8	4/21/2009	0.541	0.501	0.200	0.500	0	940	3957	192	741	303	3

mb002	8	4/21/2009	0.572	0.500	0.200	0.750	0	1224	349	0	741	303	3
mb002	8	4/21/2009	0.546	0.500	0.200	0.500	0	1128	57	0	741	303	3
mb002	8	4/21/2009	0.552	0.500	0.200	0.750	0	1213	0	0	741	303	3
mb002	8	4/21/2009	0.549	0.500	0.200	0.750	0	1503	0	0	741	303	3
mb002	8	4/21/2009	0.523	0.500	0.200	0.750	0	1424	0	0	741	303	3
mb002	8	4/21/2009	0.554	0.748	0.200	0.500	0	920	5108	0	741	303	3
mb002	8	4/21/2009	0.547	0.747	0.200	0.500	0	1488	6373	140	741	303	3
mb002	8	4/21/2009	0.535	0.625	0.200	0.250	0	1730	0	0	741	303	3
mb002	8	4/21/2009	0.572	0.502	0.242	0.500	0	1612	23379	0	741	303	3
mb002	8	4/21/2009	0.546	0.502	0.200	0.750	0	1146	2794	0	741	303	3
mb002	8	4/21/2009	0.540	0.500	0.547	0.500	0	1756	31886	638	741	303	3
mb002	8	4/21/2009	0.541	0.500	0.200	0.750	0	1473	0	0	741	303	3
mb002	8	4/21/2009	0.550	0.500	0.670	0.500	1	1858	89313	363	741	303	3
mb002	8	4/21/2009	0.538	0.500	0.200	0.500	0	1857	134	0	741	303	3
mb003	1	4/15/2009	0.500	0.500	0.634	-1.000	0	322	67125	268	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	224	57875	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	224	1469	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	393	3187	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.621	0.500	0	322	11594	242	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.335	-1.000	0	224	4500	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	229	2219	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.318	-1.000	0	243	4640	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.395	0.000	0	221	5234	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3364	3547	0	747	243	13
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4313	10485	225	747	243	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	760	0	0	747	243	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2720	0	0	747	243	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2235	391	0	747	243	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3546	0	0	747	243	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1950	1531	0	747	243	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2473	3016	0	747	243	9
mb003	1	4/15/2009	0.500	0.500	0.610	0.750	0	2258	34484	1007	747	243	7
mb003	1	4/15/2009	0.500	0.500	0.800	0.750	0	3186	133922	2389	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.283	-1.000	0	3296	23437	543	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	7824	29688	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2591	704	0	773	350	15
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1191	5031	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	249	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	226	16703	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.355	-1.000	0	222	4734	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	210	26719	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	219	1813	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.399	0.000	0	210	5031	0	773	350	1

mb003	1	4/15/2009	0.500	0.500	0.408	-1.000	0	253	6188	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1140	5375	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.770	0.750	0	3379	130469	898	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	84	23047	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	51	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	4746	2563	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3674	1734	0	773	350	12
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	633	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	653	3219	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2747	5703	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.201	-1.000	0	282	3407	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	585	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	727	1984	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	130	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	2092	8359	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.329	0.250	0	2352	46469	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3212	6531	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.320	0.000	0	2386	45796	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1949	1422	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4776	3125	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	8920	10172	0	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.538	0.500	0	5953	172016	249	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	3510	2593	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.420	0.500	0	194	4891	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3281	1484	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	228	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	232	15015	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	224	49265	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2145	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	2656	80187	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	2675	3156	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1161	2032	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2040	8062	244	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	134	9281	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2022	125	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.273	-1.000	0	2416	39593	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2814	94	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1937	1906	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2229	0	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1135	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1305	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	84	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4172	7281	0	773	350	10

mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	3824	9015	371	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	1842	2563	404	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	672	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.385	1.000	0	134	3094	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2987	0	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2497	0	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.221	-1.000	0	298	3954	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3810	28375	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1096	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4430	4906	227	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1394	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	40	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	9642	7000	0	773	350	14
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2337	2593	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2308	8907	0	773	350	4
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	9388	1687	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.658	0.000	0	3275	119093	519	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2189	188	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	8011	28281	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2513	3188	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1164	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.234	0.500	0	1436	8828	333	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	84	2766	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.295	0.000	0	799	8297	275	773	350	4
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	10836	60672	452	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.261	0.750	0	6288	98282	0	773	350	9
mb003	1	4/15/2009	0.250	0.500	0.572	0.000	0	644	32938	159	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	4624	27406	0	773	350	14
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	5335	2578	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	630	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	132	703	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	358	2344	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	30138	120625	641	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1049	63	0	773	350	3
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	1908	22157	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.302	-1.000	0	796	8890	263	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	4851	12047	507	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4292	25656	0	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.664	1.000	0	2644	106890	497	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3124	3156	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.237	0.750	0	2700	21422	321	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1134	1281	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6495	7218	0	773	350	9

mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2517	19406	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	2233	5797	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.800	0.750	0	84	13109	1024	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.292	0.500	0	724	5922	348	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	80	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6775	5250	0	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	132	937	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	681	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5814	7234	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1524	7218	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	4503	3782	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.266	0.750	0	2615	8313	642	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.203	0.500	0	2252	8625	399	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1113	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	327	2828	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1133	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.755	-1.000	0	3842	81750	1645	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.554	0.750	0	2579	55375	589	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.000	0	1877	1468	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5850	5078	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1328	1313	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3769	3156	339	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.620	0.750	1	6396	81844	2678	773	350	14
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	4007	94	181	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4319	3406	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1110	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1381	1281	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2345	3375	0	773	350	12
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	8555	5172	0	773	350	18
mb003	1	4/15/2009	0.250	0.500	0.200	0.250	0	1738	2172	0	773	350	4
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1144	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.215	-1.000	0	1962	3047	520	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	84	7234	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	2471	9531	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	489	42812	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3112	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	647	1141	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	4118	1609	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5032	26985	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6854	3969	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	3186	11187	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.316	1.000	0	7287	44750	1058	773	350	17
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3310	13766	0	773	350	7

mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2861	2265	320	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	892	5235	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	10934	469	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	3286	5235	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	2048	6500	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	0.000	0	2902	5625	183	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6709	7219	539	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2436	4937	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.291	-1.000	0	707	12328	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.623	-1.000	0	1728	92610	326	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	83	2985	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.281	0.000	0	1828	9407	525	773	350	4
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	53	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6838	2234	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	565	0	0	773	350	3
mb003	1	4/15/2009	0.250	0.500	0.200	0.000	0	660	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	647	984	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2163	4531	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	134	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	1662	1062	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	7440	47	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	2109	7515	0	773	350	7
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	2697	0	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1391	469	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1440	5375	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1476	3219	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.800	0.500	0	850	33125	1175	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.294	-1.000	0	2576	9250	702	773	350	4
mb003	1	4/15/2009	0.250	0.500	0.200	0.000	0	670	703	337	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	638	6000	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	8246	1500	0	773	350	1
mb003	1	4/15/2009	0.318	0.500	0.219	-1.000	0	224	2938	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.800	0.500	0	3409	157078	1500	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1470	0	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4634	25047	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	84	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	1689	4812	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3138	15234	375	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	6188	11094	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3482	0	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	3091	688	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.322	-1.000	0	3012	34578	417	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.698	0.500	0	469	10422	696	773	350	1

mb003	1	4/15/2009	0.500	0.500	0.332	-1.000	0	1612	16422	423	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.327	0.250	0	1026	4047	616	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	3148	10469	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.340	-1.000	0	1193	17578	230	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	107	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.432	0.750	0	2514	21750	857	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.239	-1.000	0	952	3218	424	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	83	2672	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5203	2891	613	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.576	1.000	0	2217	52296	522	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	4963	17563	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3618	3860	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	2961	3438	249	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1921	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.287	0.250	0	898	5468	428	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.623	0.250	0	2328	31110	1227	773	350	5
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	1875	1797	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3432	2109	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.275	0.750	0	1352	5515	516	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	0.750	0	84	8078	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	90	17688	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	5493	25484	23	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4207	2719	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	843	4016	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.509	-1.000	0	937	21375	298	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.243	0.500	0	2167	31546	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3379	3485	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.228	-1.000	0	5065	27969	549	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.522	0.250	0	2018	17672	1041	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	84	859	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	3260	5562	0	773	350	8
mb003	1	4/15/2009	0.500	0.500	0.294	0.250	0	6436	55094	695	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3110	203	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.800	-1.000	0	602	32328	798	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.271	0.500	0	916	14891	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	820	0	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	124	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4204	0	0	773	350	15
mb003	1	4/15/2009	0.500	0.500	0.200	1.000	0	3849	2187	0	773	350	4
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	1099	0	0	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	603	281	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3677	5719	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2294	22562	0	773	350	2

mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	87	5906	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	659	5719	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.345	0.750	0	7403	63812	1004	773	350	13
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	134	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.730	-1.000	0	729	20750	572	773	350	2
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5092	14421	0	773	350	6
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	86	6500	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	65	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3316	8266	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	7236	15485	0	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	84	985	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	8128	5250	164	773	350	16
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2074	6219	394	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	633	1891	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3061	1640	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	111	6047	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	21969	11547	0	773	350	106
mb003	1	4/15/2009	0.500	0.500	0.473	-1.000	0	2669	56187	370	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.500	-1.000	0	84	3641	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4349	0	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.279	0.250	0	84	1406	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	3657	2828	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1410	3828	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	54	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	2087	187	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.210	-1.000	0	83	1047	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5088	32875	0	773	350	15
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1109	2672	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3075	7266	0	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1907	3609	0	773	350	5
mb003	1	4/15/2009	0.500	0.500	0.338	-1.000	0	1722	34907	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2509	1891	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.000	0	36593	25906	53	773	350	197
mb003	1	4/15/2009	0.500	0.500	0.721	-1.000	0	7973	34638000	1159	773	350	25
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	134	0	0	773	350	1
mb003	1	4/15/2009	0.370	0.500	0.200	-1.000	0	83	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.308	0.250	0	3163	10813	814	773	350	11
mb003	1	4/15/2009	0.500	0.500	0.205	0.500	0	20655	139203	973	773	350	18
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	2462	6734	449	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2289	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.800	0.750	0	1567	55266	1083	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	56	0	0	773	350	1
mb003	1	4/15/2009	0.250	0.500	0.200	-1.000	0	1411	6969	0	773	350	2

mb003	1	4/15/2009	0.370	0.500	0.200	-1.000	0	87	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4347	688	0	773	350	3
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	3676	1985	248	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	5560	937	0	773	350	13
mb003	1	4/15/2009	0.250	0.500	0.632	0.750	0	2926	76813	611	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1903	3078	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	79	0	0	773	350	1
mb003	1	4/15/2009	0.370	0.500	0.200	-1.000	0	86	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.000	0	4050	3000	207	773	350	10
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6807	0	0	773	350	13
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3674	0	0	773	350	7
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	134	0	0	773	350	1
mb003	1	4/15/2009	0.370	0.500	0.200	-1.000	0	84	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	4839	1843	0	773	350	19
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2291	1219	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	37	0	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	4578	375	0	773	350	9
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2173	11390	0	773	350	1
mb003	1	4/15/2009	0.370	0.500	0.500	-1.000	0	84	11110	0	773	350	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	5865	0	0	773	350	14
mb003	1	4/15/2009	0.292	0.500	0.691	0.500	0	3958	84265	1200	773	253	7
mb003	1	4/15/2009	0.446	0.370	0.236	-1.000	0	137	1938	0	773	253	1
mb003	1	4/15/2009	0.370	0.370	0.500	-1.000	0	84	9406	0	773	253	1
mb003	1	4/15/2009	0.368	0.328	0.800	0.750	0	359	25765	1751	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3296	0	0	773	253	1
mb003	1	4/15/2009	0.335	0.250	0.200	-1.000	0	2766	2890	0	773	253	9
mb003	1	4/15/2009	0.257	0.250	0.649	0.500	0	2795	41704	1587	773	253	8
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	7496	0	0	773	253	15
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	6776	0	0	773	253	18
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2971	0	0	773	253	14
mb003	1	4/15/2009	0.500	0.500	0.200	-1.000	0	10361	0	0	773	253	20
mb003	1	4/15/2009	0.500	0.500	0.200	0.000	0	119	125	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	4488	5907	0	773	253	5
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	1172	1500	246	773	253	3
mb003	1	4/15/2009	0.500	0.500	0.553	0.500	0	3359	54000	948	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.576	0.500	0	1497	15797	1035	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	1523	6891	259	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	367	1531	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	505	0	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	56	297	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.250	0	1550	7125	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	2511	7454	0	773	253	1
mb003	1	4/15/2009	0.500	0.500	0.224	0.750	0	1744	2375	534	773	253	3

mb003	1	4/15/2009	0.500	0.500	0.200	0.750	0	1487	938	0	773	253	3
mb003	1	4/15/2009	0.500	0.500	0.200	0.500	0	1515	4312	0	773	253	2
mb003	1	4/15/2009	0.500	0.500	0.390	0.000	0	1057	6125	696	773	253	3
mb003	1	4/15/2009	0.500	0.500	0.560	0.750	0	537	7203	724	773	253	1
mb003	2	4/16/2009	0.504	0.722	0.367	0.500	0	4805	10360	1299	773	350	1
mb003	2	4/16/2009	0.484	0.369	0.800	0.500	0	2867	87296	2649	773	350	15
mb003	2	4/16/2009	0.503	0.369	0.200	0.500	0	2110	12938	26	773	350	7
mb003	2	4/16/2009	0.492	0.369	0.386	-1.000	0	1058	5125	724	773	350	1
mb003	2	4/16/2009	0.500	0.369	0.200	-1.000	0	1033	3078	0	773	350	3
mb003	2	4/16/2009	0.497	0.369	0.200	0.000	0	1314	5437	0	773	350	6
mb003	2	4/16/2009	0.494	0.369	0.200	0.250	0	6349	2062	0	773	350	14
mb003	2	4/16/2009	0.500	0.369	0.200	-1.000	0	1016	0	0	773	350	3
mb003	2	4/16/2009	0.500	0.369	0.200	-1.000	0	956	0	0	773	350	3
mb003	2	4/16/2009	0.499	0.334	0.200	-1.000	0	686	0	0	773	350	1
mb003	2	4/16/2009	0.492	0.334	0.200	-1.000	0	2441	1922	0	773	350	9
mb003	2	4/16/2009	0.499	0.252	0.200	0.750	0	3674	1485	0	773	350	1
mb003	2	4/16/2009	0.486	0.252	0.200	0.500	0	530	2688	0	773	350	4
mb003	2	4/16/2009	0.490	0.250	0.200	0.750	0	8300	4500	299	773	350	9
mb003	2	4/16/2009	0.496	0.250	0.277	0.500	0	11360	78219	1076	773	350	14
mb003	2	4/16/2009	0.499	0.250	0.548	0.750	0	6238	71000	1618	773	350	6
mb003	2	4/16/2009	0.491	0.250	0.200	-1.000	0	8452	0	0	773	350	5
mb003	2	4/16/2009	0.489	0.250	0.200	-1.000	0	5831	328	0	773	350	34
mb003	3	4/21/2009	0.490	0.750	0.416	0.250	0	3150	36953	715	773	350	10
mb003	3	4/21/2009	0.519	0.750	0.800	0.750	0	670	32656	731	773	350	1
mb003	3	4/21/2009	0.520	0.750	0.200	0.750	0	2471	12625	58	773	350	1
mb003	3	4/21/2009	0.487	0.750	0.200	0.500	0	694	1547	0	773	350	1
mb003	3	4/21/2009	0.509	0.747	0.200	0.250	0	2189	3187	0	773	350	4
mb003	3	4/21/2009	0.514	0.502	0.200	0.250	0	2709	12078	133	773	350	7
mb003	3	4/21/2009	0.500	0.502	0.200	-1.000	0	619	703	0	773	350	1
mb003	3	4/21/2009	0.439	0.500	0.200	-1.000	0	1789	985	0	773	350	8
mb003	3	4/21/2009	0.444	0.500	0.251	0.750	0	1728	3031	587	773	350	8
mb003	3	4/21/2009	0.510	0.500	0.200	-1.000	0	2008	5828	0	773	350	8
mb003	3	4/21/2009	0.479	0.500	0.711	0.250	2	4502	77984	4811	773	350	9
mb003	3	4/21/2009	0.472	0.500	0.800	0.750	0	2464	77875	2835	773	350	15
mb003	3	4/21/2009	0.492	0.500	0.800	1.000	0	9299	885328	7677	841	553	5
mb003	3	4/21/2009	0.483	0.500	0.200	-1.000	0	7620	547	89	841	553	10
mb003	3	4/21/2009	0.465	0.500	0.200	-1.000	0	649	0	0	841	553	1
mb003	3	4/21/2009	0.497	0.500	0.200	-1.000	0	5010	2657	0	841	553	6
mb003	3	4/21/2009	0.454	0.500	0.200	-1.000	0	2295	688	0	841	553	8
mb003	3	4/21/2009	0.479	0.500	0.200	0.750	0	2140	1187	15	841	553	7
mb003	3	4/21/2009	0.501	0.500	0.200	0.750	0	7336	0	219	841	553	12
mb003	3	4/21/2009	0.486	0.500	0.200	0.750	0	2710	1078	0	841	553	1
mb003	3	4/21/2009	0.507	0.500	0.200	0.000	0	3649	125	0	841	553	10

mb003	3	4/21/2009	0.442	0.500	0.260	-1.000	0	2109	8640	558	841	553	8
mb003	3	4/21/2009	0.473	0.500	0.200	-1.000	0	1417	0	0	841	553	1
mb003	3	4/21/2009	0.486	0.500	0.200	-1.000	0	3914	0	0	841	553	8
mb003	3	4/21/2009	0.495	0.500	0.200	0.250	0	2713	1437	0	841	553	14
mb003	3	4/21/2009	0.463	0.500	0.200	-1.000	0	84	0	0	841	553	1
mb003	3	4/21/2009	0.463	0.500	0.266	-1.000	0	87	1391	0	841	553	1
mb003	3	4/21/2009	0.456	0.500	0.200	-1.000	0	2169	9969	0	841	553	8
mb003	3	4/21/2009	0.497	0.500	0.200	-1.000	0	2345	0	0	841	553	8
mb003	3	4/21/2009	0.483	0.500	0.200	0.250	0	2580	2062	0	841	553	4
mb003	3	4/21/2009	0.504	0.500	0.200	0.500	0	1038	1453	0	841	553	1
mb003	3	4/21/2009	0.469	0.500	0.200	0.500	0	1279	0	0	841	553	1
mb003	3	4/21/2009	0.486	0.493	0.221	0.750	0	337	2828	180	841	553	1
mb003	3	4/21/2009	0.500	0.492	0.200	-1.000	0	134	562	0	841	553	1
mb003	3	4/21/2009	0.478	0.469	0.296	0.500	0	4203	11219	931	841	553	17
mb003	3	4/21/2009	0.467	0.375	0.200	-1.000	0	3375	12438	0	841	553	9
mb003	3	4/21/2009	0.468	0.375	0.200	0.500	0	3411	5672	535	841	553	5
mb003	3	4/21/2009	0.440	0.371	0.200	-1.000	0	115	0	0	841	553	1
mb003	3	4/21/2009	0.492	0.336	0.200	-1.000	0	2117	187	0	841	553	9
mb003	3	4/21/2009	0.371	0.303	0.200	-1.000	0	122	0	0	841	553	1
mb003	3	4/21/2009	0.479	0.302	0.200	-1.000	0	591	687	0	841	553	1
mb003	3	4/21/2009	0.471	0.302	0.200	0.500	0	2260	547	79	841	553	1
mb003	3	4/21/2009	0.443	0.302	0.200	0.250	0	2552	1937	0	841	553	11
mb003	3	4/21/2009	0.463	0.500	0.200	-1.000	0	87	0	0	841	553	1
mb003	3	4/21/2009	0.442	0.500	0.200	-1.000	0	2109	0	0	841	553	8
mb003	3	4/21/2009	0.470	0.251	0.200	0.750	0	266	1016	0	841	553	1
mb003	3	4/21/2009	0.514	0.251	0.313	0.500	0	2070	12875	606	841	553	1
mb003	3	4/21/2009	0.490	0.251	0.444	0.500	0	2557	20781	948	841	553	9
mb003	3	4/21/2009	0.470	0.251	0.283	0.500	0	2528	42859	0	841	553	1
mb003	3	4/21/2009	0.502	0.250	0.200	-1.000	0	2511	1172	0	841	553	9
mb003	3	4/21/2009	0.457	0.250	0.200	0.500	0	2018	3641	0	841	553	4
mb003	3	4/21/2009	0.495	0.250	0.200	-1.000	0	2184	828	0	841	553	6
mb003	3	4/21/2009	0.510	0.250	0.200	-1.000	0	2116	0	0	841	553	7
mb003	3	4/21/2009	0.484	0.250	0.200	-1.000	0	1969	157	0	841	553	8
mb003	3	4/21/2009	0.491	0.250	0.200	-1.000	0	2348	0	0	841	553	9
mb003	3	4/21/2009	0.489	0.250	0.200	0.250	0	2165	1468	0	841	553	8
mb003	3	4/21/2009	0.463	0.250	0.237	0.500	0	1892	16485	259	841	553	3
mb003	3	4/21/2009	0.466	0.250	0.714	0.500	0	2252	42375	2238	841	553	4
mb003	3	4/21/2009	0.471	0.250	0.388	0.500	0	2366	2922	1103	841	553	4
mb003	3	4/21/2009	0.479	0.250	0.255	1.000	0	2835	4063	735	841	553	5
mb003	3	4/21/2009	0.493	0.250	0.200	-1.000	0	2130	0	0	841	553	4
mb003	3	4/21/2009	0.494	0.250	0.200	0.500	0	2636	1110	0	841	553	8
mb003	3	4/21/2009	0.426	0.250	0.200	-1.000	0	1125	0	0	841	553	3
mb003	3	4/21/2009	0.404	0.250	0.200	-1.000	0	1089	0	0	841	553	3

mb003	3	4/21/2009	0.396	0.250	0.200	-1.000	0	1123	0	0	841	553	3
mb003	3	4/21/2009	0.465	0.250	0.200	-1.000	0	2511	1656	0	841	553	9
mb003	3	4/21/2009	0.491	0.250	0.248	0.500	0	2436	2954	689	841	553	10
mb003	3	4/21/2009	0.483	0.250	0.200	-1.000	0	2788	0	0	841	553	10
mb003	3	4/21/2009	0.426	0.250	0.200	-1.000	0	1096	0	0	841	553	3
mb003	3	4/21/2009	0.442	0.494	0.200	0.250	0	2220	3578	0	841	554	8
mb003	3	4/21/2009	0.470	0.251	0.200	0.750	0	503	4594	0	841	554	1
mb003	3	4/21/2009	0.414	0.250	0.461	0.500	0	2435	28656	803	841	554	8
mb003	3	4/21/2009	0.410	0.250	0.200	0.250	0	2195	2359	0	841	554	8
mb003	3	4/21/2009	0.398	0.250	0.200	0.250	0	2128	1906	0	841	554	10
mb004	1	4/16/2009	0.432	0.000	0.800	0.500	0	359	59015	1494	1171	296	1
mb004	1	4/16/2009	0.483	0.491	0.393	0.500	0	3200	29187	916	1171	296	13
mb004	1	4/16/2009	0.470	0.250	0.251	0.500	0	2401	9235	669	1171	296	7
mb004	1	4/16/2009	0.469	0.250	0.800	0.500	0	7880	281562	3029	1171	296	15
mb004	1	4/16/2009	0.484	0.248	0.260	0.000	0	2794	3281	889	1171	296	13
mb004	1	4/16/2009	0.483	0.186	0.200	0.000	0	2765	813	0	1171	296	10
mb004	1	4/16/2009	0.442	0.186	0.265	0.500	0	6546	7656	1159	1171	296	13
mb004	1	4/16/2009	0.477	0.003	0.360	1.000	0	3638	14782	1146	1171	296	12
mb004	2	4/19/2009	0.494	0.490	0.437	0.250	0	3451	7578	1800	1171	296	12
mb004	2	4/19/2009	0.488	0.493	0.800	0.750	0	5132	282906	4452	1171	296	11
mb004	2	4/19/2009	0.489	0.492	0.200	0.000	0	3037	672	0	1171	296	11
mb004	2	4/19/2009	0.496	0.492	0.200	0.000	0	4055	641	0	1171	296	16
mb004	2	4/19/2009	0.493	0.306	0.200	0.750	0	3036	4093	0	1171	296	10
mb004	2	4/19/2009	0.494	0.252	0.800	0.250	0	3385	83719	2014	1171	296	10
mb004	2	4/19/2009	0.470	0.250	0.222	0.250	0	2885	7047	674	1171	296	8
mb004	2	4/19/2009	0.454	0.000	0.757	0.500	0	1009	43296	824	1171	296	3
mb004	3	4/20/2009	0.008	0.500	0.232	0.000	0	14658	10813	1523	1171	296	7
mb004	3	4/20/2009	0.311	0.008	0.242	0.500	0	1331	5094	587	1171	296	6
mb004	3	4/20/2009	0.010	0.000	0.800	0.000	0	2122	81125	1092	1171	296	3
mb004	3	4/20/2009	0.464	0.005	0.360	0.000	1	3579	21828	971	1171	296	10
mb004	3	4/20/2009	0.476	0.333	0.684	0.000	1	2451	77531	609	1171	296	7
mb004	3	4/20/2009	0.480	0.333	0.454	0.000	0	3275	10672	1799	1171	296	13
mb004	3	4/20/2009	0.477	0.210	0.694	0.750	1	11418	387781	1142	1171	296	18
mb004	3	4/20/2009	0.441	0.248	0.537	0.500	0	2569	33859	1153	1171	296	8
mb004	4	4/21/2009	0.478	0.178	0.800	1.000	1	266	54204	5936	1171	296	1
mb004	4	4/21/2009	0.413	0.000	0.800	-1.000	0	337	11203	2601	1171	296	1
mb004	4	4/21/2009	0.478	0.178	0.200	1.000	0	266	0	0	1171	296	1
mb004	4	4/21/2009	0.413	0.000	0.275	-1.000	0	337	1531	603	1171	296	1
mb004	4	4/21/2009	0.478	0.178	0.800	1.000	1	266	20547	869	1171	296	1
mb004	4	4/21/2009	0.545	0.736	0.287	0.000	0	399	4937	246	1171	296	1
mb004	4	4/21/2009	0.493	0.710	0.200	0.000	0	1382	3344	0	1171	296	1
mb004	4	4/21/2009	0.508	0.726	0.200	0.000	0	1179	4203	0	1171	296	1
mb004	4	4/21/2009	0.453	0.492	0.800	0.250	1	533	98328	1561	1171	296	1

mb004	4	4/21/2009	0.493	0.492	0.800	0.500	1	707	31313	862	1171	296	1
mb004	4	4/21/2009	0.497	0.306	0.520	0.500	1	616	16031	113	1171	296	2
mb004	4	4/21/2009	0.437	0.000	0.330	0.000	1	1276	11297	435	1171	296	2
mb004	4	4/21/2009	0.439	0.008	0.411	0.000	1	1759	25187	474	1171	296	3
mb004	4	4/21/2009	0.323	0.000	0.358	0.000	1	1224	16625	348	1171	296	4
mb004	4	4/21/2009	0.406	0.000	0.216	0.000	1	1655	6657	419	1171	296	4
mb004	4	4/21/2009	0.468	0.000	0.200	0.000	1	16216	31531	750	1171	296	7
mb004	4	4/21/2009	0.457	0.125	0.499	0.500	0	1159	27422	338	1171	296	4
mb004	4	4/21/2009	0.472	0.008	0.703	0.500	2	752	18000	827	1171	296	5
mb004	4	4/21/2009	0.464	0.000	0.200	-1.000	0	1084	0	0	1171	296	4
mb004	4	4/21/2009	0.420	0.000	0.200	-1.000	0	996	0	0	1171	296	2
mb004	4	4/21/2009	0.464	0.000	0.200	-1.000	0	1084	0	0	1171	296	4
mb004	4	4/21/2009	0.420	0.000	0.200	0.500	0	996	2016	167	1171	296	2
mb004	4	4/21/2009	0.507	0.750	0.200	0.500	0	2504	2859	0	1171	296	9
mb004	4	4/21/2009	0.492	0.726	0.200	0.250	0	2545	5125	1	1171	296	8
mb004	4	4/21/2009	0.470	0.250	0.200	0.250	0	3065	7485	61	1171	296	12
mb005	1	4/15/2009	0.500	0.500	0.303	0.750	0	1392	25346	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1437	14153	62	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.267	0.500	0	1128	18100	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.207	0.750	0	1797	18712	134	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	0.750	0	2373	15357	261	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.389	0.750	0	1502	20807	626	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	0.750	0	1975	15454	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.355	0.500	0	1808	13587	926	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.323	0.500	0	1559	26384	162	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	0.500	0	963	7548	50	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	0.500	0	812	9441	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1085	1226	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.209	0.750	0	1126	14120	0	1449	466	3
mb005	1	4/15/2009	0.500	0.500	0.200	0.500	0	1160	6783	107	1449	466	3
mb005	1	4/15/2009	0.527	0.750	0.200	-1.000	0	5166	10650	0	1449	466	14
mb005	1	4/15/2009	0.515	0.750	0.200	0.750	0	5411	11902	0	1449	466	27
mb005	1	4/15/2009	0.527	0.750	0.200	0.500	0	5166	6890	163	1449	466	14
mb005	1	4/15/2009	0.518	0.750	0.447	0.750	2	4542	35743	1404	1449	466	16
mb005	1	4/15/2009	0.523	0.750	0.200	0.750	0	5660	2810	0	1449	466	21
mb005	1	4/15/2009	0.504	0.750	0.200	0.500	0	2896	5687	0	1449	466	15
mb005	1	4/15/2009	0.539	0.750	0.200	-1.000	0	7689	1598	0	1449	466	23
mb005	1	4/15/2009	0.534	0.750	0.740	-1.000	2	6687	222512	1166	1449	466	17
mb005	1	4/15/2009	0.514	0.750	0.200	-1.000	0	3020	1915	0	1449	466	17
mb005	1	4/15/2009	0.516	0.750	0.200	0.750	0	3485	4423	339	1449	466	16
mb005	1	4/15/2009	0.518	0.748	0.200	1.000	0	2386	1686	0	1449	466	15
mb005	1	4/15/2009	0.508	0.625	0.200	0.750	0	6202	4303	203	1449	466	33
mb005	1	4/15/2009	0.510	0.502	0.200	0.500	0	2885	4307	0	1449	466	14

mb005	1	4/15/2009	0.495	0.501	0.200	0.500	0	3350	1102	309	1449	466	16
mb005	1	4/15/2009	0.533	0.500	0.264	0.750	3	24670	70960	1887	1449	466	39
mb005	1	4/15/2009	0.528	0.750	0.200	0.500	0	1248	5972	0	1449	466	3
mb005	1	4/15/2009	0.530	0.750	0.200	0.500	0	514	4426	188	1449	466	2
mb005	1	4/15/2009	0.535	0.750	0.200	0.500	0	547	4692	0	1449	466	2
mb005	1	4/15/2009	0.520	0.500	0.200	0.250	0	8723	1177	0	1449	466	5
mb005	1	4/15/2009	0.540	0.750	0.597	-1.000	1	4051	23559	1895	1449	466	1
mb005	1	4/15/2009	0.533	0.750	0.200	0.750	1	6017	11707	414	1449	466	2
mb005	1	4/15/2009	0.523	0.750	0.227	-1.000	1	4442	29013	431	1449	466	4
mb005	1	4/15/2009	0.544	0.750	0.200	-1.000	0	2537	2307	0	1449	466	4
mb005	1	4/15/2009	0.513	0.750	0.800	0.750	3	1250	83192	2846	1449	466	3
mb005	1	4/15/2009	0.547	0.750	0.200	-1.000	0	3891	1033	0	1449	466	3
mb005	1	4/15/2009	0.591	0.750	0.200	-1.000	0	945	9115	0	1449	466	3
mb005	1	4/15/2009	0.538	0.750	0.200	-1.000	0	1685	8196	0	1449	466	4
mb005	1	4/15/2009	0.550	0.750	0.200	-1.000	0	804	2506	0	1449	466	2
mb005	1	4/15/2009	0.513	0.747	0.200	-1.000	0	410	3945	0	1449	466	1
mb005	1	4/15/2009	0.506	0.747	0.257	-1.000	0	513	7924	0	1449	466	1
mb005	1	4/15/2009	0.518	0.744	0.343	0.750	0	310	6383	0	1449	466	1
mb005	1	4/15/2009	0.513	0.744	0.200	-1.000	0	335	1047	0	1449	466	1
mb005	1	4/15/2009	0.524	0.744	0.200	-1.000	0	246	363	0	1449	466	1
mb005	1	4/15/2009	0.495	0.568	0.200	-1.000	0	301	149	0	1449	466	1
mb005	1	4/15/2009	0.499	0.568	0.265	0.750	0	344	3937	276	1449	466	1
mb005	1	4/15/2009	0.498	0.568	0.237	-1.000	0	415	5907	0	1449	466	1
mb005	1	4/15/2009	0.508	0.568	0.200	-1.000	0	255	503	0	1449	466	1
mb005	1	4/15/2009	0.500	0.568	0.200	-1.000	0	419	1951	0	1449	466	1
mb005	1	4/15/2009	0.491	0.542	0.200	-1.000	0	430	937	0	1449	466	1
mb005	1	4/15/2009	0.492	0.538	0.200	-1.000	0	387	2529	0	1449	466	1
mb005	1	4/15/2009	0.487	0.411	0.200	-1.000	0	256	0	0	1449	466	1
mb005	1	4/15/2009	0.488	0.411	0.200	-1.000	0	304	516	0	1449	466	1
mb005	1	4/15/2009	0.477	0.411	0.200	-1.000	0	312	0	0	1449	466	1
mb005	1	4/15/2009	0.483	0.264	0.200	-1.000	0	238	0	0	1449	466	1
mb005	1	4/15/2009	0.486	0.264	0.200	-1.000	0	253	0	0	1449	466	1
mb005	1	4/15/2009	0.486	0.264	0.200	-1.000	0	314	30	0	1449	466	1
mb005	1	4/15/2009	0.484	0.264	0.200	-1.000	0	216	968	0	1449	466	1
mb005	1	4/15/2009	0.485	0.263	0.200	-1.000	0	312	0	0	1449	466	1
mb005	1	4/15/2009	0.495	0.259	0.200	-1.000	0	248	0	0	1449	466	1
mb005	1	4/15/2009	0.487	0.259	0.200	-1.000	0	344	3123	0	1449	466	1
mb005	1	4/15/2009	0.489	0.259	0.200	-1.000	0	268	0	0	1449	466	1
mb005	1	4/15/2009	0.488	0.259	0.354	0.750	0	403	6403	332	1449	466	1
mb005	1	4/15/2009	0.477	0.254	0.200	-1.000	0	293	2242	0	1449	466	1
mb005	1	4/15/2009	0.477	0.254	0.391	-1.000	0	282	6622	0	1449	466	1
mb005	1	4/15/2009	0.472	0.254	0.200	-1.000	0	444	731	0	1449	466	1
mb005	1	4/15/2009	0.485	0.250	0.200	-1.000	0	245	0	0	1449	466	1

mb005	1	4/15/2009	0.467	0.250	0.200	-1.000	0	305	705	0	1449	466	1
mb005	1	4/15/2009	0.461	0.250	0.200	-1.000	0	287	533	0	1449	466	1
mb005	1	4/15/2009	0.444	0.250	0.200	-1.000	0	314	438	0	1449	466	1
mb005	1	4/15/2009	0.446	0.250	0.200	-1.000	0	336	0	0	1449	466	1
mb005	1	4/15/2009	0.525	0.750	0.293	0.500	2	3154	19286	773	1449	466	16
mb005	1	4/15/2009	0.519	0.750	0.800	-1.000	4	1119	425903	3073	1449	466	7
mb005	1	4/15/2009	0.549	0.750	0.200	-1.000	0	1762	0	0	1449	466	1
mb005	1	4/15/2009	0.526	0.750	0.200	1.000	0	2210	1719	0	1449	466	9
mb005	1	4/15/2009	0.501	0.750	0.226	0.750	0	2002	8378	636	1449	466	8
mb005	1	4/15/2009	0.544	0.750	0.280	0.750	0	737	7309	433	1449	466	4
mb005	1	4/15/2009	0.527	0.748	0.200	-1.000	0	1296	4000	0	1449	466	4
mb005	1	4/15/2009	0.538	0.748	0.287	0.750	0	549	6891	290	1449	466	2
mb005	1	4/15/2009	0.526	0.745	0.435	-1.000	0	573	5510	1031	1449	466	4
mb005	1	4/15/2009	0.750	0.500	0.500	-1.000	0	1305	1539001	0	1449	466	3
mb005	1	4/15/2009	0.545	0.745	0.200	-1.000	0	358	575	0	1449	466	1
mb005	1	4/15/2009	0.530	0.747	0.200	-1.000	0	359	0	0	1449	466	1
mb005	1	4/15/2009	0.555	0.750	0.200	-1.000	0	194	0	0	1449	466	1
mb005	1	4/15/2009	0.608	0.750	0.200	-1.000	0	298	0	0	1449	466	1
mb005	1	4/15/2009	0.555	0.750	0.411	-1.000	0	194	2981	566	1449	466	1
mb005	1	4/15/2009	0.608	0.750	0.200	-1.000	0	298	0	680	1449	466	1
mb005	2	4/16/2009	0.523	0.750	0.200	-1.000	1	3776	14756	390	1449	466	12
mb005	2	4/16/2009	0.533	0.748	0.572	-1.000	1	2829	27465	1981	1449	466	10
mb005	2	4/16/2009	0.515	0.740	0.200	-1.000	0	5457	1974	0	1449	466	20
mb005	2	4/16/2009	0.516	0.583	0.200	-1.000	0	3970	3996	0	1449	466	15
mb005	2	4/16/2009	0.545	0.260	0.724	-1.000	1	1375	25322	1616	1449	466	6
mb005	2	4/16/2009	0.537	0.250	0.200	-1.000	0	1371	8439	0	1449	466	6
mb005	2	4/16/2009	0.531	0.250	0.200	0.750	0	1351	7405	388	1449	466	6
mb005	2	4/16/2009	0.527	0.250	0.430	-1.000	0	1467	15817	989	1449	466	7
mb005	2	4/16/2009	0.528	0.250	0.422	0.750	0	1349	28337	283	1449	466	6
mb005	2	4/16/2009	0.525	0.250	0.218	0.750	0	1461	16930	98	1449	466	6
mb005	2	4/16/2009	0.521	0.750	0.200	-1.000	0	4706	15435	654	1449	466	11
mb005	2	4/16/2009	0.540	0.750	0.650	-1.000	1	3840	118280	634	1449	466	13
mb005	2	4/16/2009	0.550	0.750	0.284	-1.000	1	5196	31826	852	1449	466	28
mb005	2	4/16/2009	0.525	0.748	0.263	0.750	1	3523	10338	911	1449	466	14
mb005	2	4/16/2009	0.521	0.748	0.200	-1.000	0	3351	4203	224	1449	466	13
mb005	2	4/16/2009	0.517	0.748	0.200	-1.000	0	3833	0	0	1449	466	19
mb005	2	4/16/2009	0.525	0.500	0.200	0.750	0	6317	3737	0	1449	466	14
mb005	2	4/16/2009	0.494	0.260	0.200	-1.000	0	3498	3901	488	1449	466	13
mb005	2	4/16/2009	0.483	0.250	0.200	-1.000	0	3400	2721	78	1449	466	12
mb005	3	4/18/2009	0.489	0.750	0.212	-1.000	0	895	11389	0	1449	466	1
mb005	3	4/18/2009	0.557	0.750	0.575	0.750	1	1073	25179	325	1449	466	1
mb005	3	4/18/2009	0.507	0.750	0.226	-1.000	0	830	11263	0	1449	466	2
mb005	3	4/18/2009	0.469	0.436	0.200	-1.000	0	555	4631	0	1449	466	2

mb005	3	4/18/2009	0.481	0.421	0.210	-1.000	0	496	6264	0	1449	466	3
mb005	3	4/18/2009	0.479	0.421	0.238	-1.000	0	273	3901	0	1449	466	2
mb005	3	4/18/2009	0.443	0.421	0.620	-1.000	0	686	36536	453	1449	466	3
mb005	3	4/18/2009	0.464	0.254	0.497	-1.000	0	833	24826	0	1449	466	3
mb006	1	4/16/2009	0.250	0.473	0.500	0.250	0	48	2547	0	1011	358	1
mb006	1	4/16/2009	0.250	0.473	0.200	0.250	0	98	0	0	1011	358	1
mb006	1	4/16/2009	0.250	0.473	0.200	0.250	0	48	0	0	1011	358	1
mb006	1	4/16/2009	0.250	0.473	0.200	0.250	0	45	0	0	1011	358	1
mb006	1	4/16/2009	0.552	0.889	0.263	0.000	0	1591	2500	718	1011	358	7
mb006	1	4/16/2009	0.606	0.750	0.237	0.000	0	455	6469	0	1011	358	1
mb006	1	4/16/2009	0.506	0.750	0.200	0.750	0	22773	2031	0	1011	358	12
mb006	1	4/16/2009	0.495	0.750	0.200	-1.000	0	2733	0	0	1011	358	8
mb006	1	4/16/2009	0.446	0.750	0.200	-1.000	0	3502	0	0	1011	358	9
mb006	1	4/16/2009	0.515	0.750	0.200	-1.000	0	3260	828	0	1011	358	8
mb006	1	4/16/2009	0.518	0.750	0.200	-1.000	0	2024	0	0	1011	358	7
mb006	1	4/16/2009	0.510	0.750	0.200	0.750	0	2839	1812	99	1011	358	5
mb006	1	4/16/2009	0.513	0.750	0.200	-1.000	0	2689	0	0	1011	358	6
mb006	1	4/16/2009	0.518	0.750	0.200	-1.000	0	2431	0	0	1011	358	7
mb006	1	4/16/2009	0.533	0.750	0.200	-1.000	0	2051	0	0	1011	358	6
mb006	1	4/16/2009	0.516	0.750	0.200	-1.000	0	2473	0	0	1011	358	7
mb006	1	4/16/2009	0.527	0.750	0.200	-1.000	0	1796	500	0	1011	358	1
mb006	1	4/16/2009	0.525	0.750	0.200	-1.000	0	2813	500	0	1011	358	8
mb006	1	4/16/2009	0.000	0.750	0.200	-1.000	0	4655	0	0	1011	358	15
mb006	1	4/16/2009	0.000	0.000	0.200	1.000	0	1079	734	0	1011	358	3
mb006	1	4/16/2009	0.487	0.000	0.200	1.000	0	1079	10516	0	1011	358	3
mb006	1	4/16/2009	0.448	0.000	0.200	-1.000	0	983	0	0	1011	358	3
mb006	1	4/16/2009	0.464	0.021	0.200	1.000	0	1335	1687	0	1011	358	3
mb006	1	4/16/2009	0.457	0.021	0.200	-1.000	0	1212	235	0	1011	358	3
mb006	1	4/16/2009	0.340	0.000	0.200	1.000	0	1759	7468	278	1011	358	3
mb006	2	4/19/2009	0.750	0.744	0.200	0.750	0	117	359	315	1011	358	1
mb006	2	4/19/2009	0.445	0.750	0.200	-1.000	0	1319	4047	0	1011	358	5
mb006	2	4/19/2009	0.741	0.747	0.200	-1.000	0	1245	0	0	1011	358	5
mb006	2	4/19/2009	0.502	0.739	0.397	1.000	0	3173	4890	1312	1011	358	1
mb006	2	4/19/2009	0.503	0.739	0.425	1.000	0	3212	4766	1532	1011	358	9
mb006	2	4/19/2009	0.502	0.739	0.200	0.000	0	2910	2266	0	1011	358	1
mb006	2	4/19/2009	0.505	0.739	0.200	-1.000	0	725	0	0	1011	358	1
mb006	2	4/19/2009	0.500	0.739	0.200	-1.000	0	7357	0	0	1011	358	3
mb006	2	4/19/2009	0.502	0.739	0.200	0.000	0	2293	2921	0	1011	358	6
mb006	2	4/19/2009	0.507	0.739	0.200	-1.000	0	541	0	0	1011	358	1
mb006	2	4/19/2009	0.403	0.500	0.200	-1.000	0	5078	0	0	1011	358	8
mb006	2	4/19/2009	0.029	0.473	0.200	-1.000	0	1270	250	146	1011	358	5
mb006	2	4/19/2009	0.000	0.469	0.200	-1.000	0	1320	0	0	1011	358	5
mb006	2	4/19/2009	0.501	0.444	0.246	-1.000	0	5038	0	1012	1011	358	15

mb006	2	4/19/2009	0.500	0.403	0.200	-1.000	0	1176	0	0	1011	358	5
mb006	2	4/19/2009	0.500	0.403	0.200	0.750	0	1231	3750	0	1011	358	5
mb006	2	4/19/2009	0.253	0.403	0.200	0.500	0	1278	5266	197	1011	358	5
mb006	2	4/19/2009	0.399	0.403	0.200	-1.000	0	1208	265	0	1011	358	5
mb006	2	4/19/2009	0.500	0.403	0.200	-1.000	0	1285	0	0	1011	358	5
mb006	2	4/19/2009	0.500	0.403	0.200	0.500	0	1199	1640	0	1011	358	5
mb006	2	4/19/2009	0.250	0.403	0.200	-1.000	0	3645	0	0	1011	358	12
mb006	2	4/19/2009	0.251	0.403	0.200	0.000	0	2548	2922	0	1011	358	7
mb006	2	4/19/2009	0.250	0.403	0.200	0.000	0	3589	1703	176	1011	358	10
mb006	2	4/19/2009	0.250	0.403	0.200	0.000	0	3450	328	0	1011	358	9
mb006	2	4/19/2009	0.250	0.403	0.200	-1.000	0	3649	31	0	1011	358	10
mb006	2	4/19/2009	0.250	0.403	0.200	0.000	0	2162	1203	324	1011	358	10
mb006	2	4/19/2009	0.875	0.403	0.200	-1.000	0	114	0	0	1011	358	1
mb006	2	4/19/2009	0.504	0.403	0.200	-1.000	0	1447	0	0	1011	358	1
mb006	2	4/19/2009	0.500	0.403	0.200	-1.000	0	613	0	0	1011	358	1
mb006	2	4/19/2009	0.500	0.403	0.800	0.750	8	1044	57969	4174	1011	358	1
mb006	2	4/19/2009	0.500	0.403	0.200	-1.000	0	545	0	0	1011	358	1
mb006	2	4/19/2009	0.000	0.744	0.200	-1.000	0	1264	375	0	1011	358	5
mb006	2	4/19/2009	0.000	0.744	0.200	-1.000	0	1188	1532	0	1011	358	5
mb006	2	4/19/2009	0.525	0.744	0.200	0.250	0	1166	125	0	1011	358	5
mb006	2	4/19/2009	0.469	0.744	0.200	-1.000	0	1213	266	0	1011	358	5
mb006	3	4/22/2009	0.521	0.750	0.529	1.000	6	3227	13359	2103	1011	358	10
mb006	3	4/22/2009	0.517	0.750	0.200	-1.000	0	2788	1062	0	1011	358	9
mb006	3	4/22/2009	0.508	0.750	0.200	0.750	0	4091	7234	462	1011	358	11
mb006	3	4/22/2009	0.509	0.750	0.355	0.750	2	3392	6875	1093	1011	358	11
mb006	3	4/22/2009	0.512	0.750	0.655	1.000	4	2895	37266	4089	1011	358	10
mb006	3	4/22/2009	0.521	0.750	0.200	1.000	0	2536	3703	0	1011	358	8
mb006	3	4/22/2009	0.507	0.744	0.200	-1.000	0	2259	0	0	1011	358	8
mb006	3	4/22/2009	0.525	0.750	0.200	0.000	0	2913	2203	0	1011	358	9
mb006	3	4/22/2009	0.520	0.750	0.200	0.750	0	2656	10031	280	1011	358	8
mb006	3	4/22/2009	0.507	0.750	0.200	-1.000	0	3239	0	0	1011	358	9
mb006	3	4/22/2009	0.514	0.744	0.200	0.750	0	2667	3703	0	1011	358	10
mb006	3	4/22/2009	0.510	0.744	0.200	0.750	0	2860	19218	0	1011	358	10
mb006	3	4/22/2009	0.408	0.250	0.200	0.750	0	2667	17516	93	1011	358	8
mb006	3	4/22/2009	0.679	0.986	0.200	1.000	0	109	547	0	1011	358	1
mb006	3	4/22/2009	0.494	0.919	0.458	1.000	0	122	3281	24	1011	358	1
mb006	3	4/22/2009	0.540	0.910	0.500	0.250	0	116	3625	0	1011	358	1
mb006	3	4/22/2009	0.561	0.910	0.500	1.000	0	126	4453	0	1011	358	1
mb006	3	4/22/2009	0.535	0.910	0.500	-1.000	0	49	1578	0	1011	358	1
mb006	3	4/22/2009	0.529	0.910	0.200	-1.000	0	113	141	0	1011	358	1
mb006	3	4/22/2009	0.511	0.903	0.200	-1.000	0	86	500	0	1011	358	1
mb006	3	4/22/2009	0.479	0.893	0.200	-1.000	0	124	0	0	1011	358	1
mb006	3	4/22/2009	0.444	0.762	0.500	1.000	0	114	9218	0	1011	358	1

mb006	3	4/22/2009	0.490	0.911	0.443	-1.000	0	123	3266	0	1011	358	1
mb007	1	4/18/2009	0.500	0.500	0.509	0.750	0	2896	32313	1001	741	242	10
mb007	1	4/18/2009	0.500	0.500	0.654	0.750	0	2864	55258	1028	741	242	11
mb007	1	4/18/2009	0.500	0.500	0.319	0.750	0	4655	30220	816	741	242	15
mb007	1	4/18/2009	0.500	0.500	0.630	-1.000	0	2065	28453	1444	741	242	6
mb007	1	4/18/2009	0.750	0.500	0.800	0.750	0	2871	31454422	1692	834	242	7
mb007	1	4/18/2009	0.500	0.500	0.800	1.000	0	2839	29600228	2711	834	242	5
mb007	1	4/18/2009	0.750	0.500	0.661	1.000	0	2356	160317	482	834	242	8
mb007	1	4/18/2009	0.750	0.500	0.786	0.750	0	2753	66310	1209	834	242	6
mb007	1	4/18/2009	0.750	0.500	0.800	0.750	1	2473	68003	2799	834	242	7
mb007	1	4/18/2009	0.500	0.500	0.544	0.750	0	5375	82316	1197	834	242	12
mb007	1	4/18/2009	0.750	0.500	0.549	0.750	0	2936	39126	1051	834	242	7
mb007	1	4/18/2009	0.549	0.750	0.500	0.750	0	1321	1044924	0	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.385	-1.000	0	1201	5660	781	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.200	-1.000	0	1198	0	0	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.200	-1.000	0	1333	298	0	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.284	0.250	0	1198	15474	174	834	242	5
mb007	1	4/18/2009	0.750	0.500	0.290	0.250	0	1319	17852	168	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.200	-1.000	0	1201	5707	0	834	242	5
mb007	1	4/18/2009	0.500	0.500	0.289	0.250	0	1300	13252	309	834	242	5
mb007	1	4/18/2009	0.750	0.500	0.215	-1.000	0	1268	5035	383	834	242	5
mb007	1	4/18/2009	0.750	0.500	0.500	0.000	0	47	17904	0	834	242	1
mb007	1	4/18/2009	0.500	0.500	0.606	-1.000	0	48	8145	222	834	242	1
mb007	1	4/18/2009	0.750	0.500	0.500	0.000	0	47	1822	0	834	242	1
mb007	1	4/18/2009	0.500	0.500	0.756	-1.000	0	101	12316	543	834	242	1
mb007	1	4/18/2009	0.500	0.500	0.394	-1.000	0	115	2722	0	834	242	1
mb007	1	4/18/2009	0.750	0.500	0.689	0.750	0	3749	122197720	665	834	242	10
mb007	1	4/18/2009	0.750	0.500	0.328	0.750	0	3470	16619	847	834	242	14
mb008	1	4/17/2009	0.500	0.500	0.737	0.750	1	2213	42875	2427	1013	595	7
mb008	1	4/17/2009	0.500	0.500	0.800	0.750	1	3862	100517	3794	1013	595	7
mb008	1	4/17/2009	0.500	0.500	0.800	0.750	1	1890	54028	2055	1013	595	6
mb008	1	4/17/2009	0.750	0.500	0.729	0.750	1	3248	13814690	770	1013	595	8
mb008	1	4/17/2009	0.750	0.750	0.597	0.500	1	1552	16823	5398	1013	595	6
mb009	1	4/15/2009	0.500	0.500	0.330	-1.000	0	219	4337	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.200	0.750	0	232	2300	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	223	0	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.473	-1.000	0	229	6497	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	2635	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	777	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	16141	0	0	929	250	8
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	475	0	0	929	250	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	3089	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	438	0	0	929	250	2

mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	161	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	415	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	438	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2608	25	0	929	250	14
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	3027	0	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	2608	0	0	929	250	14
mb009	1	4/15/2009	0.500	0.500	0.200	0.500	0	3027	1169	0	929	250	2
mb009	1	4/15/2009	0.500	0.500	0.200	0.500	0	2608	1750	0	929	250	14
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1177	1763	0	929	250	4
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1415	0	0	929	250	3
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1000	0	0	929	250	3
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	1033	4516	0	929	250	4
mb009	1	4/15/2009	0.500	0.500	0.500	1.000	0	1	1218	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	1	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.500	1.000	0	1	2951	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	1	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	233	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	0.500	0	130	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.201	0.500	0	134	1616	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.421	0.500	0	130	3173	52	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	-1.000	0	282	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	0.500	0	134	0	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	132	198	0	1413	376	1
mb009	1	4/15/2009	0.500	0.500	0.200	1.000	0	132	237	0	1413	376	1
mb010	1	4/16/2009	0.500	0.500	0.527	0.000	1	4201	30828	5880	1411	388	21

mb010	1	4/16/2009	0.500	0.500	0.200	-1.000	0	3380	0	0	1411	388	14
mb010	1	4/16/2009	0.500	0.500	0.307	-1.000	1	476	1797	525	1411	388	1
mb010	1	4/16/2009	0.500	0.500	0.517	-1.000	14	22773	23703	6484	1411	388	12
mb010	1	4/16/2009	0.500	0.500	0.407	-1.000	0	461	188	1583	1411	388	1
mb010	1	4/16/2009	0.500	0.500	0.800	-1.000	0	5016	11766734	1953	1411	373	20
mb010	1	4/16/2009	0.500	0.500	0.474	0.750	0	3711	16375	3215	1411	373	19
mb010	1	4/16/2009	0.500	0.500	0.607	0.750	0	649	8078	3238	1411	373	2
mb010	1	4/16/2009	0.500	0.500	0.800	1.000	8	6238	468890	19352	1411	700	6
mb010	1	4/16/2009	0.500	0.500	0.227	0.750	0	8920	6094	1195	1411	700	11
mb010	1	4/16/2009	0.500	0.500	0.200	0.500	0	9388	5344	0	1411	700	9
mb010	1	4/16/2009	0.500	0.500	0.200	-1.000	0	3830	4078	716	1411	535	9
mb010	1	4/16/2009	0.500	0.500	0.419	0.250	0	3317	11593	1542	1411	535	8
mb010	1	4/16/2009	0.500	0.500	0.251	-1.000	0	3123	6797	911	1411	535	12
mb010	1	4/16/2009	0.500	0.500	0.633	-1.000	0	1018	14219	2003	1411	373	2
mb010	1	4/16/2009	0.500	0.500	0.200	-1.000	0	3250	3437	0	1411	373	2
mb010	1	4/16/2009	0.500	0.500	0.200	-1.000	0	4939	28047	0	1411	373	3
mb011	1	4/18/2009	0.500	0.500	0.217	-1.000	0	1080	14031	0	1011	253	3
mb011	1	4/18/2009	0.500	0.500	0.800	-1.000	2	2567	109791	1508	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	3058	0	0	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.388	-1.000	0	2567	32056	585	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.800	0.750	2	2597	97802	1754	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	2804	2127	0	955	253	9
mb011	1	4/18/2009	0.500	0.500	0.200	0.750	0	2597	0	0	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	2567	0	0	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	3131	665	0	955	253	7
mb011	1	4/18/2009	0.500	0.500	0.200	0.500	0	2567	3089	0	955	253	8
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	2453	1103	0	955	253	7
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	2804	0	0	955	253	9
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	3131	0	0	955	253	7
mb011	1	4/18/2009	0.500	0.500	0.200	-1.000	0	2804	507	0	955	253	9
mb011	1	4/18/2009	0.500	0.500	0.800	0.000	3	377	117544	3780	955	253	1
mb011	1	4/18/2009	0.500	0.500	0.800	0.750	1	121	115537	1518	955	253	1
mb011	1	4/18/2009	0.500	0.500	0.800	0.250	0	50	7572	2181	955	253	1

Control Group Data:

Tester	Session #	Date	Average Predicted Rating	Bayes Predicted Rating	Implicit Rating	Clicks	Article Length (chars)	Viewing Time (ms)	Mouse Movement (Pixels)	Frame X Size (Pixels)	Frame Y Size (Pixels)	Clickable elements
mc001	1	4/17/2009	0.500	0.500	0.800	1	214	40078	2294	1177	471	1
mc001	1	4/17/2009	0.500	0.500	0.800	6	3769	455594	6343	1177	624	2
mc001	1	4/17/2009	0.500	0.500	0.800	0	1525	408735	1189	1177	624	1
mc001	1	4/17/2009	0.500	0.500	0.200	0	3769	0	0	1177	624	2
mc001	1	4/17/2009	0.500	0.500	0.800	2	1525	72734	789	1177	624	1
mc001	1	4/17/2009	0.500	0.500	0.800	1	1685	83016	1123	1177	624	6
mc001	1	4/17/2009	0.500	0.500	0.800	2	3577	103922	2129	1177	624	8
mc001	1	4/17/2009	0.500	0.500	0.618	0	2488	99453	428	1177	624	1
mc001	1	4/17/2009	0.500	0.500	0.628	0	2152	65266	451	1177	624	3
mc001	1	4/17/2009	0.500	0.500	0.800	2	11303	305656	2596	1177	624	11
mc001	1	4/17/2009	0.500	0.500	0.411	2	12145	181875	884	1177	624	10
mc001	1	4/17/2009	0.500	0.500	0.342	0	289	5938	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.302	0	289	5234	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.500	0	289	11657	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.333	0	289	5781	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.200	0	289	3250	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.500	0	289	9875	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.200	0	289	3437	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.348	0	289	6032	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.354	0	357	7578	0	1177	398	2
mc001	1	4/17/2009	0.500	0.500	0.325	0	1184	18125	229	1177	398	3
mc001	1	4/17/2009	0.594	0.750	0.200	0	1155	2844	257	1177	398	3
mc001	1	4/17/2009	0.500	0.500	0.229	0	1145	11516	201	1177	398	3
mc001	1	4/17/2009	0.500	0.500	0.200	0	1257	9969	0	1177	398	3
mc001	1	4/17/2009	0.500	0.500	0.370	0	1079	14297	484	1177	398	3
mc001	1	4/17/2009	0.470	0.750	0.500	0	1285	46500	0	1177	398	1
mc001	1	4/17/2009	0.447	0.748	0.500	0	1338	57891	0	1177	398	1
mc001	1	4/17/2009	0.436	0.654	0.800	1	1265	178391	1084	1177	398	1
mc001	1	4/17/2009	0.450	0.750	0.200	0	1234	0	0	1177	398	1
mc001	1	4/17/2009	0.500	0.500	0.800	1	5067	219515	2209	1177	577	8
mc001	1	4/17/2009	0.500	0.500	0.800	0	3150	87719	1290	1177	577	4
mc001	1	4/17/2009	0.600	0.750	0.429	0	1231	24516	317	1177	578	2
mc001	1	4/17/2009	0.611	0.500	0.472	0	3912	76859	580	1177	578	1
mc001	1	4/17/2009	0.748	0.500	0.219	1	4855	6922	407	1177	578	1
mc001	1	4/17/2009	0.500	0.500	0.283	0	4651	18312	914	1177	578	1
mc001	1	4/17/2009	0.500	0.500	0.200	0	1891	0	0	1177	578	1
mc001	1	4/17/2009	0.500	0.500	0.674	1	4651	159313	310	1177	578	1
mc001	1	4/17/2009	0.500	0.500	0.247	0	2846	2000	874	1177	578	1
mc001	1	4/17/2009	0.579	0.750	0.200	0	2576	3563	628	1177	578	13

mc001	1	4/17/2009	0.500	0.500	0.200	1	3349	0	0	1177	578	18
mc001	2	4/20/2009	0.478	0.427	0.200	0	1319	1984	191	1177	578	3
mc001	2	4/20/2009	0.500	0.500	0.800	4	1236	124469	3994	1177	578	3
mc001	2	4/20/2009	0.445	0.500	0.616	0	7610	364375	581	1177	578	1
mc001	2	4/20/2009	0.500	0.500	0.622	0	411	38484	372	1177	578	1
mc001	2	4/20/2009	0.250	0.750	0.800	4	2950	45428500	5528	1177	578	15
mc001	3	4/21/2009	0.500	0.375	0.314	0	3255	22860	753	1177	578	17
mc001	3	4/21/2009	0.250	0.750	0.200	0	2950	0	0	1177	578	15
mc001	3	4/21/2009	0.500	0.375	0.200	0	3255	0	0	1177	578	17
mc001	3	4/21/2009	0.459	0.500	0.200	0	3094	3687	0	1177	578	14
mc001	3	4/21/2009	0.250	0.250	0.200	0	485	0	0	1177	578	1
mc001	3	4/21/2009	0.250	0.250	0.200	0	334	0	0	1177	578	1
mc001	3	4/21/2009	0.449	0.253	0.200	0	392	0	0	1177	578	1
mc001	3	4/21/2009	0.250	0.750	0.200	0	2950	0	0	1177	578	15
mc001	3	4/21/2009	0.500	0.500	0.200	0	3349	156	0	1177	578	18
mc001	3	4/21/2009	0.250	0.750	0.200	0	2950	0	0	1177	578	15
mc001	3	4/21/2009	0.500	0.375	0.800	1	3255	368031	2916	1177	578	17
mc001	3	4/21/2009	0.462	0.250	0.247	0	2186	14797	474	1177	578	8
mc002	1	4/15/2009	0.500	0.500	0.653	0	2317	35172	3082	924	331	9
mc002	1	4/15/2009	0.500	0.500	0.706	0	2537	46531	1594	924	331	9
mc002	1	4/15/2009	0.500	0.500	0.800	1	1481	261000	997	924	331	3
mc002	1	4/15/2009	0.500	0.500	0.800	2	1126	308859	1366	924	331	3
mc002	1	4/15/2009	0.500	0.500	0.724	0	1975	54687	787	924	331	3
mc002	1	4/15/2009	0.500	0.500	0.200	0	963	11500	0	924	331	3
mc002	1	4/15/2009	0.500	0.500	0.200	0	1305	8469	0	924	331	3
mc002	1	4/15/2009	0.500	0.500	0.800	1	861	180062	895	924	331	1
mc002	1	4/15/2009	0.500	0.500	0.674	0	1474	31547	896	924	331	1
mc002	2	4/16/2009	0.547	0.750	0.599	0	616	10172	818	924	331	2
mc002	2	4/16/2009	0.558	0.750	0.800	0	1159	32609	2380	924	331	4
mc002	2	4/16/2009	0.500	0.500	0.800	2	16216	555438	3179	924	397	7
mc002	2	4/16/2009	0.500	0.500	0.539	0	3579	48703	1108	924	397	10
mc002	3	4/17/2009	0.750	0.750	0.800	1	3026	430532	8853	924	310	10
mc002	3	4/17/2009	0.750	0.750	0.800	0	3451	120812	1497	924	260	12
mc002	3	4/17/2009	0.750	0.750	0.517	0	2765	24406	1209	924	304	10
mc002	4	4/19/2009	0.622	0.750	0.663	1	1506	47531	321	924	398	2
mc002	4	4/19/2009	0.595	0.750	0.429	0	709	8422	590	924	398	1
mc002	4	4/19/2009	0.582	0.750	0.506	0	1505	34937	338	924	398	3
mc002	4	4/19/2009	0.593	0.750	0.599	0	1805	53407	311	924	398	3
mc002	5	4/20/2009	0.579	0.750	0.325	0	946	12250	288	924	398	3
mc002	5	4/20/2009	0.596	0.750	0.334	0	1212	15984	313	924	398	3
mc002	6	4/21/2009	0.616	0.750	0.800	0	1299	32687	2055	924	398	4
mc002	6	4/21/2009	0.573	0.500	0.800	0	1276	139141	3011	924	398	2
mc002	6	4/21/2009	0.540	0.750	0.435	0	1424	31719	178	924	398	3

mc002	6	4/21/2009	0.567	0.750	0.200	0	940	1078	0	924	398	3
mc002	6	4/21/2009	0.567	0.750	0.500	0	1730	54735	0	924	398	3
mc002	6	4/21/2009	0.550	0.750	0.220	0	1213	16016	0	924	398	3